ENID BLYTON'S NATURE LESSONS

THE DORMOUSE

(*See p.* 38)

ENID BLYTON'S NATURE LESSONS

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WITH MANY ILLUSTRATIONS

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FOREWORD

NATURE lessons are difficult to take because they lack—or should lack—the formality demanded by other lessons. We are not imparting information all the time, but are trying to help the children to discover certain facts for themselves, either from specimens in front of them, or from observations they have made out-of-doors. We must let them talk to us, ask questions, watch, observe, dissect. It is one of the lessons in which teacher and child come close together, and wonder, admire, or applaud in unison—a delightful lesson . . . but difficult!

The lessons in this book have been written in the hope that they will help to solve that difficulty. They aim to give, not only the necessary information, but also the fresh, happy attitude essential to the enthusiastic study of Nature. The teacher will find that she can use these lessons to suit her own requirements. She can take the information from them, and present the facts in her own way—or she can present the lessons exactly as they stand, with pauses for discussion, examination of objects, or answering of questions.

She can equally well give the book to the children themselves, either as a silent-reader, a nature-reading book, or a class nature-book. There is nothing in it that a child cannot understand and follow for himself. Those teachers who can give but little time to Nature lessons will possibly prefer to use the book in the last-mentioned manner. They will be quite safe in doing so, for the results will justify themselves.

In whatever way the book is used, the teacher will find the "Questions" and "Things to do" at the end of each lesson of great help to herself and the children.

ENID BLYTON'S NATURE LESSONS

HEATHER

" The Bee is on the heather and the sun is on the Ben—
Ho, there ! Bookworm, shut your musty tome !
Come, ramble by the river that is leaping down the glen,
Come, climb the purple upland where the wild deer roam."

I THINK that is what we all would love to do on a fine sunny day in early autumn. Spring-time is beautiful with its greens and yellows, and so is summer with its medley of bright colouring—but autumn has a beauty all its own, when the heather lies for miles over moors and hills, spreading a purple-red carpet fit for the tread of a queen. And fit for the *bed* of a queen, too, for there is nothing so delightfully soft and springy to lie upon as heather. The tough wiry branches bend themselves for us and seem to form a layer of soft springs, more comfortable than the most expensive mattress we can buy. No wonder shepherds do not grumble if, for bed, they have but a heap of heather !

If heather plants grew singly, or just a few together

as do shepherd's purse, dandelions, or scabious, we should not notice them very much. " Quite a pretty little plant," we might say, and pass it by.

But because of the way it grows, because of its " *sociability* "—its liking for being with others of its kind—no one can pass heather by unnoticed. When, before your eyes, stretch hundreds and thousands of heather plants, covering every hill and every valley you can see with a warm purple, you have to stop and gaze in wonder and delight. There seems no end to it. Far away, the purple on the distant hills mingles with a mauve mist, so that it almost seems as if the heather is dissolving itself.

I think when a bee pays its very first visit to heather-clad moorland, it must imagine it has arrived at a bee's paradise, for there are so many flowers for it to taste, and the smell is so delicious. Perhaps you have tasted Heather-honey. If you have, I expect you will agree with me that it is the nicest honey there is—it has the sunshine and the wind in it.

Ling

You are sure to know the real heather. It has another name, ling. All the other plants which are like enough to heather for people to mistake them, and which often grow intermingled with it, are heaths. Both heaths and heather belong to the same family, *Ericaceæ*, but while there are many heaths, there is only one real heather. It has another name, which tells what it was once used for, and still is, in some places. This is *Kalluno*—Greek for " I cleanse "—and it was given that name because its strong, wiry branches were excellent for making into brooms to

HEATHER

(Left) Heather or Ling. (Right) Cross-leaved Heath. (Top) Stamen of Heather showing Horns.

sweep and cleanse floors and hearths. A dye can also be obtained from the heather, so that it is quite a useful plant—but the best thing it gives us is its honey.

Let us look at some heather and see what it is like. It has woody stems, and the queerest leaves, looking rather like miniature branches of a monkey-puzzle tree. The flowers, of a deep lilac colour, grow up the stem to a spike, and are thickly massed. White heather is sometimes to be found, and is said to be very lucky. You must try to find some, and then see if a piece of good luck comes to you.

You will have to use your eyes well to see a heather flower. It is so small that it is difficult to examine closely, unless you have a magnifying glass. Underneath the flower you will see four small bracts—then come four coloured *sepals*, not petals. It is the sepals that give the heather such a lovely colour!

But where are the petals, then? You can easily find them. Take a little heather flower between your finger and thumb, and pull off neatly each of the four sepals. What do you see inside? *Another* little bell, cleft in four—and this time it is the petals that form it—four tiny pinkish-mauve petals, not even big enough to hide the stamens.

Can you count how many stamens there are? You will find eight, and if your spike of heather is not too old, you will see a cloud of fine yellow dust fly out when you shake it. When the wind comes along on the hills, and sends the pollen flying here and there, it is helping the heather to make its seeds; for when the yellow dust from one plant alights on the sticky stigma of another plant, seeds begin to form, and that is just what the heather wants. If you hold

your heather spike up to the light, you will see a little stigma jutting out from each bell.

The bees help too. They put their tongues into the flower to reach the honey at the bottom, and in so doing touch two little horns that stick out from the anthers (top part) of the stamens. This shakes out the pollen on to the bee's head, and the next time it goes to a heather plant, it unconsciously rubs some of the pollen off its head on to the sticky stigma, and straightway the seeds can begin to form. So you see the heather is a lucky flower, for both wind and bees help it.

The seeds, when ripe, are in little capsules, each of which has four pockets, wherein the tiny seeds are safely stowed.

Roots and Leaves

THE heather roots go very deep down into the soil. If you think what sort of place heather grows in, you will know why. It grows usually in dry, windswept places, and there is generally little moisture to be found near the surface of the soil; so the roots have to grow far down to find the moisture below. Even then, there is not very much to be found, so the heather has to be very careful of what it gets.

Its way of taking care of its water is to have very tough small leaves. Plants give off water through their leaves, and you can quite well see that, this being the case, the smaller and tougher the leaves, the less water can escape! Whenever you find a plant with leaves peculiar in some way or other, you may be sure it has a very good reason for having them that shape. And probably if you think hard enough, you can find out the reason yourself.

Do you know what some people do with the roots of heather ? They take them and shake them absolutely free from dirt. Then they snip off the flowering branches to within two or three inches of the roots, turn the plant upside down, and put it in a little pot like that—with the root sticking up in the air ! And what do you think it looks like ? It looks just like a tiny bare tree, for the branching roots are exactly like the tapering branches of miniature trees. Then bits of green are glued here and there to look like leaves, and bright beads hung on to look like flowers ! You can imagine what a dainty little " pretend tree " is the result.

Cousins of the Heather

GROWING with the heather are many kinds of heath, which no doubt you have often found. There is the pretty Cross-leaved Heath, with its dainty, closely massed flowers, looking like a bundle of rose-coloured fairy balloons. Its leaves are placed crosswise. It is sometimes found with pure white flowers.

Then there is the Fine-leaved Heath, with leaves growing in threes. The flowers of this heath grow all up the stem, and are of a deeper colour than the Cross-leaved Heath.

The Heath family is spread very widely over the world, and can be found in North and South America, Asia, and South Africa. Some of the most beautiful kinds grow in this last country, and perhaps you have seen them in a florist's shop.

Besides those I have mentioned, there are other heaths growing in different parts of our own country, and not found anywhere else. Those I have written

of you can probably find on any heathy moorland, if you look.

Go and search for them on a fine sunny day. When you are tired, choose a place where the heather is very thick. Lie down on it on your back and look up at the blue sky. All around, you will hear the drowsy hum of bees and the sharp high notes of other insects. The smell of the heather will be wafted to you by the breeze that always blows across the heath. You will feel as if you never want to get up again, you will be so warm and comfortable and happy !

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *Why does the heather have such small leaves ?*

(2) *Tell why the roots go so deep down into the soil.*

(3) *What do you know about the flowers ?*

(4) *Draw a piece of heather from a sprig in front of you.*

(5) *See if you can make a " pretend tree " at home to bring to school one day.*

SOME SEEDS AND FRUITS

" *In every hedge and every lane*
Hips and haws are seen again,
Keys of ash and sycamore
Flutter to the woodland floor,
Dandelion clocks set out
And thistle seeds are blown about.

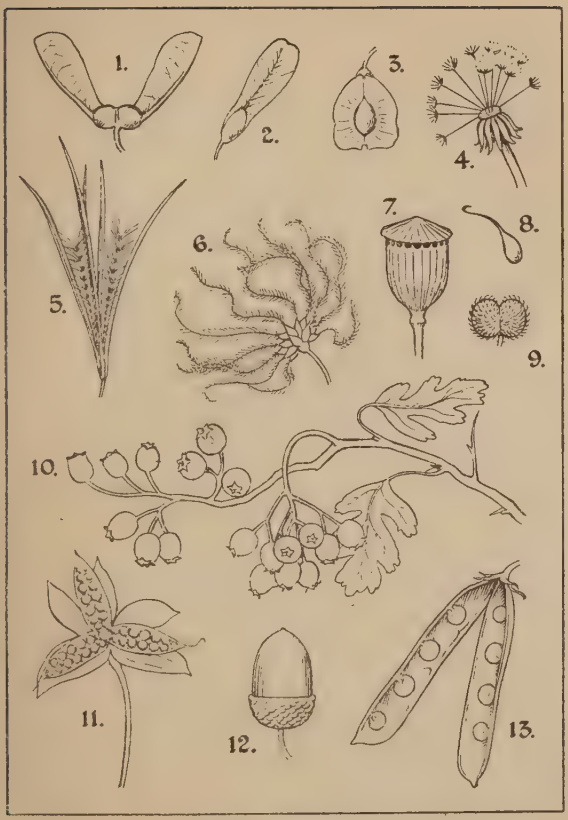
THE plants that were brilliant with flowers in the summer, all the trees whose leaves shook and whispered in the wind, and all the bushes that decked themselves with gay blossoms, have one great plan—and that is to make seeds which will grow into plants, bushes, and trees like their parent.

Now that the autumn is beginning, we can see how their plan has been worked out. Look where you please, you will see fruits and seeds ready for their journey to a new home.

Why do all these plant-babies have to find new homes? How do they get there? Does anyone help them, or do they go all by themselves?

The reason they need new homes, as far away from their parents as possible, is that, if all seeds fell by their parent plant, they would suffer from overcrowding when they grew, and would not have enough light or air. So the parent plant sends them away.

They are taken to their new homes in many ways.



SEED DISPERSAL

(1) *Sycamore*, (2) *Ash*, (3) *Elm*, (4) *Dandelion*, (5) *Willow-herb*, (6) *Clematis*, (7) *Poppy*, (8) *Geum*, (9) *Cleavers*, (10) *Haws*, (11) *Pansy*, (12) *Acorn*, (13) *Sweet Pea*.

The wind helps some. Animals and birds help others. The parent plant itself helps many, and water, too, plays a part in taking some seed-babies to another home.

The Wind

We will talk about the wind's help first, because many fruits and seeds are scattered far and wide by him. Some seed-cases grow wings and fly away with their seeds when the wind blows.

Perhaps you will think, in this connection, of the sycamore seeds, or "keys," as we call them. They are very like the keys with which we wind up our clocks. They have two little wings, and they are pretty to watch as they fly from the tree through the air, circling and twisting like fairy propellers. If you stand on a chair and throw them up in the air you will see them go twirling round and round as they slowly fall.

The ash keys, or spinners, grow wings too. I expect you have seen bunches of them hanging down from the tree. They have just one wing each, but with that they can fly a long distance in the wind, especially when it blows strongly. I have found ash keys lying in a road a long, long way from the trees.

The elm has little bunches of fruits, each fruit with a wing all round it, not just at one end as in the ash and sycamore.

Some plants provide their seed-babies with feathery plumes to help them to go sailing off in the wind. The willow-herb, whose pink flowers you are sure to have seen growing in waste places, has a very clever way of making sure its babies will have a good journey. The seed-case is long and thin. When the seeds inside are ripe, it splits downwards into four pieces,

which twist themselves back. And inside, beautifully arranged one above another, are the tiny seeds, each with a plume of very fine hairs. Directly the wind puffs along, out fly the little seeds, and float far away in the air.

Of course you have seen the dandelion clocks, and blown them to tell the time. Next time you find a clock pull one of the little fruits out and have a good look at it. It has a little parachute of hairs to carry it up into the air. It only waits for the wind to help it, and off it goes.

Near by, on the hedge, you may see the grey plumes of the clematis, or traveller's joy. Most people call it Old Man's Beard when its little fruits are all ready to fly, for it looks just like grey fluffy hair. If you look at it you will see that each wee fruit has grown a long silky feather, very delicate and soft. They are the prettiest, daintiest things.

One of the most fascinating seed-boxes is that of the poppy. Poppy seeds have no wings to spread in the wind, but they get him to help them in another way. Look at a dry poppy head. At the top, just beneath the "lid," you will see lots of little holes. Turn the head upside down and shake it. If there are still seeds inside they will come tumbling out, just like pepper out of a pot! When the wind blows, and rocks the poppy head from side to side, or shakes it roughly, it scatters out the seeds and they blow here, there, and everywhere.

When Animals Help

Now we will talk about a few plants which get animals to help them in sending their children out into the world.

They do this in two ways—either by making the fruit attractive to animals to eat, hoping then that the seeds will be scattered ; or by giving their fruits hooks or bristles, so that they catch on to the legs and coats of animals brushing by, and then are carried to other parts of the field.

The one you will probably know the best is goose-grass, or cleavers. Cleavers is a good name for this plant, because not only do the fruits cling or cleave to anyone brushing against them, but also the stems and leaves. The little fruits are covered with short-hooked prickles, and sheep and dogs often carry scores of the tiny burrs with them, shedding them here and there, as they rub through grass or bushes.

The geum, too, has its fruits armed with tiny, wiry button-hooks that catch on to the coats of animals as firmly as do the bristles of goose-grass.

The scarlet, juicy hip of the wild rose attracts birds, who, in pecking at it, peck out also the little fruits inside and so scatter them. The birds do the same for the haws, often swallowing the stone inside as well as the red case. They cannot digest the stone, and, after it has passed through the bird's body, it falls to the ground perhaps a mile away from the parent tree.

Fruits that Explode

Some plants help their seeds into the world by exploding the seed-case suddenly, and sending out the seeds with a jerk. The gorse, for example, bursts its pods with a pop, and scatters the seeds all about.

The pansy case bursts into three parts, each like a little boat, and when these dry they shrink up, and so force out the little hard seeds. If you pick a pansy seed-case, you will be astonished to see how high

the seeds jump. The violet, too, sends out its seeds in the same way, often as far as 10 feet, which is a great distance for such a tiny plant.

Floating Seeds

PLANTS that grow in the water get its help in sending their seeds away. The water-lily seeds are often sent long distances from one side of a lake to another. There are air-spaces between the seed and its coat, and so it floats about gaily until the time comes when it sinks to the mud, and there grows into a little water-lily plant.

The coconut, too, often sends its big babies on the water, and they bob about on the sea until one day, perhaps, they are cast up on a little island, and there sprout up into trees.

You will find it is exciting work to wander about fields and lanes, poking into hedges and grass, to discover seed-cases of all kinds. You will be surprised at the enormous number you will come across.

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *How do the seeds get to their new homes? What helps them?*

(2) *Put down the names of all the seeds you know that have wings, parachutes or plumes.*

(3) *How do plants get animals to help them in carrying away their seeds?*

(4) *How does the pansy send its seeds away?*

(5) *Draw as many fruits and seeds as you can.*

(6) *See how many you can find next time you are out for a walk.*

MIGRATION

" There's a north-east wind coming over the hill,
The days are shorter, the nights are chill,
Come, little brothers, we must not stay,
Warblers, cuckoos, and swallows—away ! "

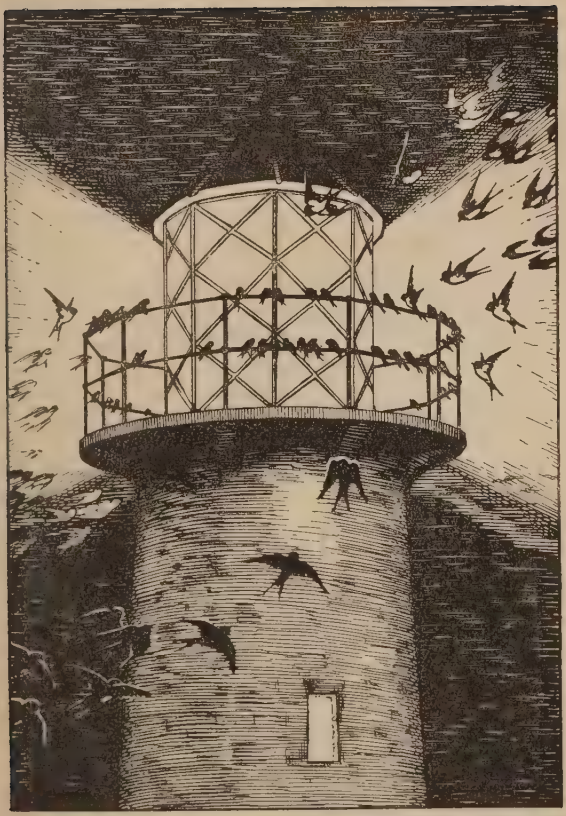
YOU must often have wondered where the cuckoo suddenly appears from in spring, and where the swallows and martins go in the late summer and autumn. Why don't they stay with us ? Where do they fly ? How do they know the way ?

Perhaps you have seen swallows collecting together for their autumn migration. I have seen them in October in hundreds on the roofs of houses and along telegraph wires, sitting there like little notes of music.

What Migration is

WE give the name " migration " to the big movements of birds from one place to another, chiefly the movements north to south in winter, and south to north in autumn. Many, many books have been written about these movements, many watchers have given their ideas about it and many answers have been made to the how, why, and wherefore questions of this mysterious journeying of birds. But the whole truth has not been found out yet, and even the cleverest men have to admit that they don't really know the true explanations of bird migration—they can only guess at them.

Swallows, swifts, martins, cuckoos, and other birds leave our land for a warmer country in late



MIGRATING SWALLOWS ATTRACTED BY A LIGHTHOUSE

In many instances the lighthouses have been equipped with perches on which the birds can rest.

summer or autumn. They go to the lands of Southern Europe, Egypt, and farther south into Africa, some of them travelling thousands of miles. Here they find plenty of insect life and warmth, but they do not nest and bring up young ones there. The swifts leave us very early indeed, when there are plenty of insects here and the weather is warm—so that to say these birds, at any rate, leave us because of the cold and scarcity of food is quite wrong. Then, again, you might say, Why do they leave the warm countries to come back to us again in the spring?

Most naturalists say that birds like to bring up their young ones in as cold a climate as they can, as then they are hardier and healthier—and that that is the reason why they migrate to cooler lands in the spring. Others say that it is an instinct from long ago which makes the birds fly to and fro in such a remarkable way—an instinct dating from the time when a great glacier forced its way slowly southwards from the Pole, and drove birds and other life before it. Each spring, when the weather was warmer, the birds returned as far north as they could—for they have a strong feeling for "home"—and so began the to and fro migration movement which has lasted down to the present time.

The Flight

I HAVE said that once every year the birds fly to and fro, sometimes over thousands of miles of land and sea. I know the question that is on the tip of your tongue—How *do* they know the way? How does a swallow from Norfolk find its way to Africa, and then back again, maybe even to the very same roof?

Perhaps it remembers from last year, you say. Well, a bird has a marvellous memory, and if it made

a journey once, it could probably make it again, recognising such things as shapes of land, lakes, rivers, and so on, on the way. But what about the young birds which have never made the journey before, and are only a few months old ? How do *they* know ?

That's easy, you say ; they go with the old ones and simply follow !

But the curious and wonderful thing is that they *don't* ! The young ones fly off by themselves, generally before the old ones, and, as far as naturalists can tell, they have no old birds with them as leaders.

Another curious thing is that many kinds of birds fly during the night when they cannot possibly see any landmarks, and can only be guided by two things —the wind and their own wonderful sense of direction. Maybe these two things together will be found some day to solve the mystery.

In spring, the birds fly northwards, or north-eastwards, with the warm, south-westerly spring wind behind them. This helps them along, and, perhaps, without its assistance many thousands of them would never reach " home." In autumn, there is a chill north-easterly wind blowing, and this carries the birds in a south-westerly direction towards the warmer lands they need. So they certainly have a great help, as regards direction, in these two winds, but this would not alone explain the marvellous way birds have of finding their route.

Accidents

It is not every bird that comes safely from country to country. Many, many of the feathered travellers perish on the journey. If a storm blows up, or the wind miscarries, they may be blown out of their way, and, tired and lost, fall into the sea or down to the

land, where they lie too tired to move if anyone approaches them.

Lighthouses are a great attraction to storm-bound birds. They seem to think they can find their way by beating against the lanterns, poor things! Light-house-keepers tell of hundreds and thousands of wretched little lost birds circling round and round the light, only to kill themselves against it at last.

Sometimes a steamer in mid-ocean will be descended upon by hundreds of little migrants, eager for a rest, or, perhaps, blown out of their way and lost. It is only the strongest, fittest, and luckiest that reach their journey's end safely.

Some Interesting Facts

Most birds, when migrating, fly very high indeed—too high to be seen by our naked eyes. Probably there is a steady wind very high up which helps them considerably. Others fly low like a trail of smoke over the water. These, of course, cannot possibly see where they are going—they must trust to instinct for direction.

Some birds can fly sixty miles an hour to keep ahead of a storm, but they cannot keep that pace up for long. Usually thirty miles an hour, or thereabouts, is the speed chosen.

Young birds leave first, and old birds return first, except in the case of the cuckoos. The old cuckoos leave five or six weeks before the young cuckoos, and are gone very early in the year indeed.

So punctual is the arrival of bird migrants in some places, that it is almost possible to tell what month or week it is by the arrival of the different birds!

The autumn migration is not so hurried and urgent as the spring rush. Sometimes the route followed

is simply a flight from one good feeding ground to another. At each, the birds rest and feed, and then go southwards once again. In spring, the birds eagerly long for the joys of nesting, and rush northwards as quickly as they can to their " home "—for where they bring their little ones up must surely be their homeland!

Partial Migrants and Birds of Passage

WHILE some of the birds we call " resident " (that is, always with us), such as the rook, the song-thrush, and the lark, do remain with us all the year round, others of the same kind go south in the autumn, though never very far beyond our isles, and return in the spring. These birds are called partial migrants, as they do not all migrate.

There are also birds which fly over our land or down our coasts, on their way from north to south, or south to north, and do not, save by accident, or for the purpose of resting a little, visit us. These are called birds of passage. When you read in the newspaper about some unusual bird being found in one of our counties, you may be sure it is either a bird of passage or a casual visitor which has come to us by mistake.

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *Why do the birds fly away from us in autumn?*

(2) *What helps them very much on their journey?*

(3) *Put down the names of some that go, and some that stay with us for the winter.*

(4) *Draw some straight lines for telegraph wires and then see if you can put some little swallows on them.*

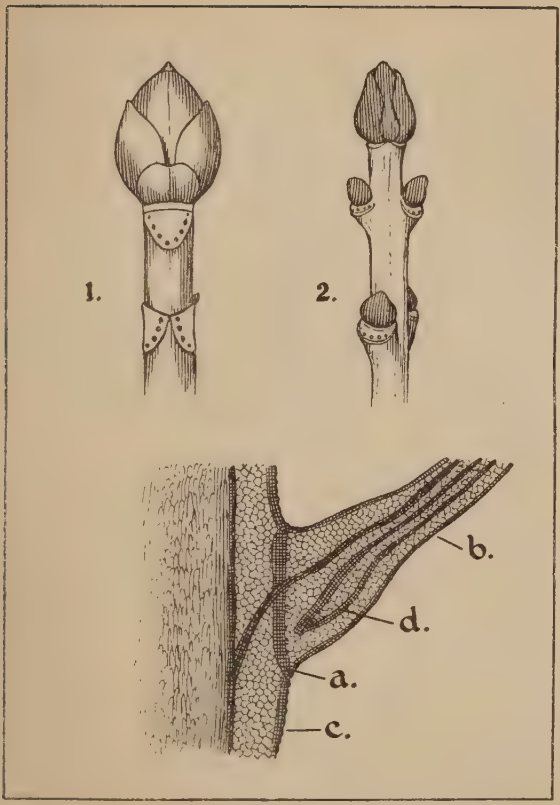
(5) *Remember to listen for the returning cuckoo next spring, and tell your teacher the date on which you heard it.*

FALLING LEAVES

" Lo ! in the middle of the wood,
The folded leaf is woo'd from out the bud
With winds upon the branch, and there
Grows green and broad, and takes no care,
Sun-steep'd at noon, and in the moon
Nightly dew-fed ; and turning yellow
Falls, and floats adown the air."

IN spring-time, we eagerly watched the fat buds of the trees break into leaf, and grow strong and green in the warm sun. It was lovely to see them, for the trees had been bare and brown such a long time. All through the summer they waved in the wind and grew a darker green. Now it is autumn, and once again the leaves change colour. Soon they will be dead, but instead of putting on sombre, sad colouring, they flare up into brilliant reds and golds, oranges and crimsons, as if to say, " We'll make the most of things whilst we can."

And so it happens that autumn is the gayest, most brilliant time of the year. Lanes, woods, and hills are ablaze with colours that harmonise and melt into each other as if they were mixed on a painter's palette. Everywhere the eye is caught by a bright splash of colour, and, if the sun is shining, the country seems almost on fire with golds and reds.



WHY LEAVES FALL

(1) *Chestnut twig showing leaf-scars.* (2) *Ash twig showing leaf-scars.* (*Below*) *Diagram showing cork layer* (a) *formed between leaf stem* (b) *and twig* (c). *One bundle of vein-fibres* (d) *has snapped; one still remains.*

Walk down the lane. See the vivid crimson dyeing the blackberry leaves. Look at the hazel's pale gold dress. See the hawthorn putting on its lovely, many-coloured gown—green and yellow, red and brown, with its crimson haws gleaming here and there. In the woods, the oak will soon be waving leaves of russet brown, which, in the pale winter sun, will stand out here and there like copper against the sky. The beech tree will don its wonderful robe of burnished gold, and spread the woods with a rustling, brilliant carpet that gradually grows darker and darker as autumn wears on. The beech leaves are perhaps the most beautiful of all autumn leaves. They are not speckled or freckled with many colours, but turn to a pure and perfect orange-gold that shines in the sun as if it were made of fine beaten metal.

The horse-chestnut trees turn to a lovely mixture of yellows and reddish browns, and their big leaves fall with a plop on the ground, leaving the tree bare enough for you to see exactly how many "conkers" there are left. Pick up a chestnut leaf, and see how beautifully the greens, browns, and yellows merge into one another. Yellow is a very favourite autumn colour. The white poplar puts on a golden yellow dress, too, and the field maple is of such a brilliant yellow that, when the sun shines, it looks as if it were alight with fairy fire. The birch tree, standing so dainty and graceful, dresses herself in a frock made of little golden jewels, that shimmer and flutter in the breeze and go flying to the ground by the score, whenever the wind blows gustily.

The wild cherry is a most beautiful sight, for it loves red, and it will change its green leaves to pinks and reds and crimsons, as if it were trying all the reds in the paint-box! The hornbeam uses many colours

—green and yellow, ruddy gold and rusty red—and makes itself as gay as if it were going to a party.

For a little while, the trees stand gay and bright, and the countryside is splashed with colours. Then, as the leaves begin to fall, the trees show their fine bodies—their dark trunks and graceful branches. The ash drops its leaves first, and the others follow —chestnut, beech, elm, birch, and hawthorn—all make a yellow, red, or brown pool around their feet, and the wind stirs and ripples it with a lovely rustling sound. The oak keeps its leaves for a long time, and the hazel clings to its pale golden leaves even to the middle of winter; but sooner or later they all fall, and the trees stand quiet in the wind, for, with the loss of their leaves, they have also lost their whispering voices.

Why Do the Leaves Change Colour?

THE most important thing to notice about the leaves is their beauty. You all love colours, and here you will find some of Nature's very loveliest ones. Collect all the brightest leaves you can find, bring them to school, and when the sun shines, hold them up so that the sunlight pours through the leaves; you will be delighted at the brilliant colours you see.

But you will want to know something else about autumn leaves besides their beauty. What makes them change colour? Why do they fall? They change colour, because the cooler weather and the shortening light act on the green colouring of the leaf in such a way that it is gradually destroyed and disappears. Other coloured substances are formed, and the leaf changes its hue. If red-coloured matter or pigment is formed, then the leaf will be red, as in the creeper

that flares crimson over the walls of houses. If the pigment is yellow, the leaf gradually becomes yellow, as in the bright field maple. If there are many pigments, the leaf will be speckled and blotched, as are the leaves of some brambles.

Why Do They Fall ?

And now, what makes the leaves fall in autumn ? How is it that they cling so tightly to the tree all the spring and summer, and yet flutter to the ground when autumn winds puff and blow ?

If you see a branch of a tree broken off by accident in the summer, you will have noticed that the leaves, though withered and brown, are still tightly clinging to the branch, and you will have to pull them off sharply, if you want to strip the branch. But in autumn, the leaves fall almost at a touch. The wind blows roughly, and down they come ! Or a wet day comes and down they fly again, unable even to bear the extra weight of the moisture !

This is what happens. The time has come when the trees want to sleep. All the food that is in the leaves is taken into the tree and stored away. No leaves, save the specially strong ones of the evergreens, can stand the cold weather, for they are too thin-skinned ; so the tree has no further use for them. If they stayed on, they would only wither, and use up space which is already wanted for next year's buds. Also, if snow came, the leaves might carry the snow and break the tree branches with the weight, just as some evergreens crack when the snow bears too heavily on their strong branches.

" So," says the tree, " we don't want you any more. You have done your work, and breathed for us, made

food for us, and given out water for us. Now you may put on bright dresses, fly in the wind, and come to rest."

The tree has a clever plan for helping the leaves to fall. Just where the leaf-stalk joins the twig, a layer of cork begins to form. This layer separates the leaf-stalk from the branch or twig, and only the little thread-like strings that run down the veins of the leaf into the stalk remain to hold the leaf still on the tree. One by one these snap, and, when the last one breaks, the leaf falls.

If you pick a leaf in summer, you will leave a little round wound, a wet gash on the stem, for the tree is not ready to part with its leaves, and the thread-like vein fibres have been torn away. But if you pick an autumn leaf and look at the place you plucked it from, you will find no wound, but a scar already dry and healed! Pick a horse-chestnut leaf and see the lovely horse-shoe scar left on the twig. Look at the base of the leaf-stalk and see the horse-shoe there too, exactly like the one on the twig. Then you can see how the vein-fibres once ran into the twig, and were gradually broken by the tree itself when the layer of cork grew between. If you look at the ash twigs, you will see their little leaf-scars quite plainly too.

The Leaf's Last Work

THE leaf has one more use before it disappears altogether. As it decays, it makes the ground rich, so that the soil every year has fresh goodness added to it. The leaves of some trees make the ground richer than others, and you will find many flowers growing below these trees in the spring-time.

Evergreens

EVERGREENS do not drop their leaves in autumn as other trees do. They drop them gradually all the year round, others taking their place, so that the trees seem always green. We are glad to have them in winter, though during the other seasons they look very dull and sombre, against the fresh greens or brilliant yellows and reds of the other trees.

Something to Do

IF you want to brighten up your schoolroom in winter-time you can do it very easily. Pick some sprays of golden beech leaves from the woods (only just as many as you want, for remember you have no right to disfigure trees), and take them home. Put them flat under a carpet on which people tread a good deal, and let them stay there for two or three weeks. Don't move them. Then take them out, bring them to school and put them in a tall vase. You will find that the lovely orange-brown leaves will remain on the branches all the winter through, and make the corners of your schoolroom bright and lovely. And when the "Book of Nature getteth short of leaves," you will still have some graceful sprays to remind you of the time when the woods were brilliant with all the colours of the autumn.

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *Describe a tree in its autumn dress. What happens when the wind blows?*
(2) *How is it that the leaves fall at a touch in the autumn?*
(3) *Do evergreens ever drop their leaves?*
(4) *Put down the names of two trees that drop their leaves in autumn, and two trees that are evergreen.*
(5) *Draw and colour a gay autumn leaf.*
(6) *Find some bright sprays and bring them to school.*

GETTING READY FOR THE WINTER

" *The chill rain is falling, the nipped worm is crawling,*
The rivers are swelling, the thunder is knelling,
For the year ;
The blithe swallows are flown, and the lizards each gone
To his dwelling."

IF somebody asked you in November where the butterflies, bees, and wasps were gone, where the toads and frogs had disappeared to, and what had happened to the hedgehogs, squirrels, snakes, and bats, I wonder what you would say.

If you are a town dweller, you have not perhaps noticed that animal life is very different in winter from what it is in the summer. You may answer, " Oh, the cold weather has killed them all, perhaps."

If you live in the country, you will know the right answer, for you will have been able to peep and watch for yourself, and perhaps have spied out where some of the animals go.

Many die, of course, especially the young ones born at the end of the summer. But most of them go to sleep in some dark hole or corner, and wait there without food, and sometimes without breathing, until warm

days come again. This winter sleep we call " hibernation." It is more than an ordinary sleep, for it is much longer, and the animal becomes very cold : it is really more dead than alive. The marvel is that it ever wakes again !

Why do so many animals and insects sleep through the winter ? The cold weather is one reason, for the temperature of many animals varies with the weather, and if it is terribly cold, the animal's temperature falls so low that it has not the energy to move about and look for food. It can only fall asleep. Another reason is that the food of many animals cannot be found in the winter months. Flies are not about, beetles have disappeared, slugs have gone. So those who feed on them must disappear, too, until food comes back again in the spring-time.

Those whose food is made up of nuts or grain, which can be stored, do not hibernate all the winter through. They take long naps, and wake up on a sunny warm morning, maybe in December or January, and have a good feed. Then they go off to sleep again directly it becomes cold. You can think of one animal that does this—the squirrel.

Where Do They Go ?

I THINK you would like to know where the animals and insects hide themselves for the winter. The country looks bare and deserted then, with only a robin or two perking and pirouetting in a bush near by, and maybe a rabbit running up the far-away hillside. But all around you, in the bottom of ditches, in hollow trees, in musty barns, beneath wood-stacks, and at the bottom of ponds, hundreds and thousands of little sleeping creatures lie hidden—all waiting for the magic

of the first really warm spring day to bring them to active life again.

Let us take the little things first. Where have the butterflies gone? Well, many die—but a great number find a warm corner in barns, or under thick ivy leaves. I once discovered a whole bunch of tortoiseshell and peacock butterflies cuddled up in a corner together. And once, for three winters, when I lived at an old farm-house, I had the same kinds of butterflies in my bedroom, huddled in a cracked corner where wall and ceiling met. In one corner by itself was a lovely yellow brimstone butterfly. Imagine what happened when the warm days came! My bedroom was like the butterfly house at the Zoo!

Bees hibernate in their hives, and as their own honey has been taken, the bee-keeper leaves them a treacly mess on which to feed. You may find big queen wasps under ivy leaves, or lodged in a crevice between stalk and wall. And you will find also, in the ivy, a number of other interesting hibernating insects, if you care to look. The big humble-bee goes down into the earth and sleeps safely there. Caterpillars turn into cocoons, and sleep the winter through in wall cracks, or in the bark of trees. Others can be found under wood piles, stones, fallen trees, and dead leaves, together with ants, beetles, and other small creatures. Snails creep under a stone, and close up their door with a horny plate, leaving just room enough to breathe.

Animal Hiding-places

I HAVE had for pets, at various times, hedgehogs, tortoises, and a toad. At least, the toad was perhaps too independent to be called a pet. He did my garden

the honour of living in it, and that was all. In winter time all disappeared.

The hedgehog went in November, having prepared himself a nice little cubby-hole in a bank. He carried leaves and moss to it in his mouth, and so lined it comfortably. Then he went to sleep, for he knew that the insects which formed his food—beetles, and so on —could not be got. But on extra warm nights he woke up and prowled round a little. It is said that hedgehogs snore loudly when sleeping, but they must sleep too soundly for that when hibernating, for certainly I never heard a sound from *my* little hedgehog in the winter.

The tortoise buried himself in the earth, beneath a bush. He worked very slowly, and looked most ridiculous. He must have been very wet during his sleep, for he had chosen a badly drained hiding-place, which became more mud than earth in the rainy winter days that followed.

The toad didn't tell me where he hid, but I think it must have been under one of the big stones by the brook-side, for that was where I accidentally found one once in December.

Frogs, too, like damp places in which to sleep the winter away. At the bottom of a pond, all among the mud and slime, is a favourite bed of theirs, or perhaps in a damp hole near by. They come out again in February or March, and so do toads.

One of the most interesting winter sleepers is the squirrel, who hoards up nuts for a warm day ; but you will hear all about him in a later Nature story, so I won't say any more just now.

Another little fellow who stores up a treasure-hoard is the quaint dormouse. He becomes very fat and plump just before hibernating, and, indeed, could

quite well last all the winter through without eating anything if necessary. However, on a warm day, he comes out and has a feed of nuts. He sleeps very, very soundly, without breathing, and if found when hibernating, is absolutely cold. It is astonishing that he ever becomes warm and active again. He hides in October, deep underground, among roots, perhaps choosing a place where he has a blanket of moss above him.

Another creature which becomes fat before hibernating is the bat. This queer animal chooses a dark barn or old shed, and hangs itself upside-down for the winter. A warm day will wake it, and send it fluttering round the barn.

The little harvest mouse stores up grain for itself in its burrow, and if it should wake up, it has a good nibble before it sleeps again.

The big badger makes quite a lot of preparations. He gets ready a specially deep room for himself and his family, and makes it soft and comfortable with fallen leaves. Then he blocks up all passages to keep out the cold, or any unwelcome visitors, and he and his family settle down for a long sleep, until a warm day or night tempts them out to see what can be picked up in the way of food.

Snakes, Newts, and Fish

THESE animals sleep two or three or more together, so that they may get as much warmth as possible. The grass snake retires to a safe place beneath the roots of trees. I was once shown several twined together under a pile of brushwood. They looked as if they would surely never be able to undo all the knots into which they had tied themselves! Some-

times they sleep in hollow trees. The adders, too, like piles of wood, and are also often found under the dry moss among heather slopes. If they can find an old bird's-nest, such as a partridge's, on the ground, they will sometimes coil round in that.

Newts leave the ponds in autumn, and go to the dry land. Here they seek a nice damp hole in a ditch, twist themselves into a thick ball, and go to sleep. Young newts sometimes stay in the water and get frozen in the ice. They can be seen " in cold storage " as it were, and the amazing thing is that they come out alive and kicking after that !

Fish are sometimes frozen in the ice, too, but most of them go down to the mud at the bottom of the pond, and stay there until spring.

Other Winter Changes

WHAT about the animals which do not sleep through the winter—the rabbits, hares, weasels, and stoats—the dogs, cats, horses, and sheep ? Do they prepare for the cold in any way ? Yes, they do. They grow nice thick coats.

The sheep have a lovely thick coat of wool, the horses are more warmly clad than usual, and both dogs and cats grow more hair to keep out the cold. Some horses, like sheep, have to have their coat clipped in the spring-time, in order to relieve them of its warmth when hot days come.

Rabbits and hares grow thicker coats, and weasels and stoats sometimes grow a completely white one, to match the snow, and to prevent their victims from seeing them. They do this regularly in parts of the country which have a great deal of snow, such as hilly districts, and districts far north, but in the south,

where it is warmer, they keep the same coat of red-brown. Sometimes they partly change it, and then they are a mixture of brown and white. Even when they turn entirely white, there is always one bit of them that is deep black, and that is the tip of their tail.

Now I think I have told you about the winter habits of most of the creatures you know. You can read a lot more about them in books, but a far better way is to find out for yourself. If you go out, say, for one hour, and look under stones, beneath piles of wood, in the ivy, and anywhere else you can think of, and then put down in a notebook the names of all the creatures you find, you will really be astonished at the number—twenty, thirty, fifty, maybe more.

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *What do we mean when we say that an animal hibernates?*

(2) *Put down the names of two hibernating creatures.*

(3) *Where do frogs hide in the winter-time?*

(4) *Why does the dormouse become so fat in the autumn?*

(5) *What do the snakes do in the winter?*

(6) *Do horses or sheep prepare for the cold weather?*

(7) *Why do northern weasels and stoats turn white in the winter?*

(8) *Next time you are out walking, look* (1) *under a big stone,* (2) *in the ivy,* (3) *in a wood-pile, and see what you can find.*

THE SQUIRREL

" High in the tree the squirrel sat
His plumy tail above him,
So merry and so cheeky that
I couldn't help but love him ! "

NOR could you, or anyone else, for the merry, black-eyed squirrel is a beautiful and lovable little creature. There he sits watching you, his pointed ears alert, and his bushy tail erect. If you are not a friend of his, he won't let you come near him. He will be off in a moment, scampering higher up the trees, and out along the branches.

But if you are his friend, he will wait for you and watch for you. He will take, in his quaint little hand-paw, the titbits you offer, and perhaps visit you in your home, if you are lucky enough to live near his wood.

The British Squirrel

OUR own native squirrel is of a lovely red-brown colour. He is not so big as he looks, for his beautiful plumy tail makes him appear much bigger than he really is, being about half as long as his body. Altogether, he measures about fifteen inches from nose to tail-end, and is the softest, quickest, most graceful little bundle you could see anywhere.

Have you ever watched a squirrel playing and scam-

THE SQUIRREL

pering about? If you see him on the ground, you will be delighted at the graceful way in which he leaps along. He goes up and down, up and down, in perfect curves, with his tail stretched out behind him. If you have ever shaken a rope on the ground into "snake-curves," you will know just how a squirrel goes.

Then watch him climb a tree. He seems to run up the trunk in a marvellous way, as lightly and as surely as if he were running over the ground. How does he do it?

Well, if I could show you his feet, you would soon see how. He has long, sharp, curved claws, and strong hind feet that can help him to leap a good way. When he runs up a tree, what he does is this—he digs his claws in and gets a good hold of the bark, then his hind feet push off in an upward leap; he digs his claws into a fresh place, and then on he goes again. He does it all so quickly that he looks as if he runs up the tree without help from claws or feet at all.

When I went to school, there were big beech trees in the school-garden. Where these grew, the ground had been hollowed out to make a dell with a sunken path winding through. Here and there were seats, and on a fine afternoon I used to take my books and go to learn my lessons all alone on one of these old seats. Everybody thought I was alone, but I wasn't. For a little red squirrel used to come and chatter to me. At first, I think, he was scolding me for disturbing his home, but afterwards it was a friendly little noise.

I called him Chippy, and he was the first squirrel who showed me how he used his tail. Directly above my head was a long, slender branch, leading to the next tree. Time and again I watched Chippy run along

it, and up the next branch, and wondered how he kept his balance so easily.

Then I noticed that he used his tail as a tight-rope walker uses his balancing pole. If he wobbled a little to the right, he turned his tail a little to the left, and so righted himself at once.

The Squirrel's Food

Of course, you all know that the squirrel loves nuts. But he likes other things too. He will eat beech-mast, which I dare say you have found many a time. It is the little three-sided seeds found in the prickly beech-nuts. Then he will take pine-cones, and eat the seeds tucked away in the woody layers. He takes all he wants, and then drops the gnawed cones down to the ground.

That reminds me of one warm sleepy afternoon in a pine-wood. I was sitting among the pine-needles, half-asleep, when plop ! a pine-cone landed in my lap. It made me jump, but I took no further notice. Then plop ! another one landed on my ankle.

" This is either children or fairies," said I, and got up to see. It was neither. It was simply a busy, hungry squirrel having a good feast above my head. I saw his startled black eyes away above me, and then he vanished with a swish of his tail.

Perhaps most of all the squirrel loves hazel-nuts. He gnaws the shell neatly, and makes a round hole to get at the nut, or else splits the shell downwards. He has excellent teeth for this sort of thing, for, like the rabbit's, they are hard, sharp, and strong, and do not stop growing. His mouth, too, is shaped so that his lips are not in the way when he is gnawing.

Sometimes squirrels get very much annoyed, if

anyone happens to gather hazel-nuts from trees they consider to be their own special property. They are really very funny then, for they will sit a little distance away, on another tree, and scold and grumble. They will even get cross enough to stamp their little front paws !

Winter Stores

THE squirrel does not hibernate when the winter comes, but takes good long naps. On warm sunny days, such as we get sometimes in December and January, he wakes up and stretches himself. Then he goes for a little scamper up and down and round about.

Then, of course, he feels hungry. What can he eat in the winter-time ? Ah, the squirrel is wise enough to have made preparations, not for a " rainy day," but for a sunny day. In autumn, he collects little bundles of beech-mast or hazel-nuts, and hides them in cubby-holes, so that when he wakes during his winter sleep he may have a little feast.

He hides them in so many places that really I don't think he *can* remember them all. In this hollow tree, and that hollow tree, at the bottom of that bush, under those roots, here and there in the ground—and anywhere else that looks cosy and safe, he will hide his precious nuts ! I have often found the little treasure store a squirrel has put by. But I never take it, because that little pile might perhaps be the one he will remember, and how upset he would be to find it gone !

Where He Sleeps

THE squirrel builds himself nests for resting-places. They are built up in the trees, and some of them are beautifully made. In one of these the squirrel sleeps,

curled up into a cosy ball. Sometimes he takes an old crow's-nest and adapts it to his own use.

Those he builds are made of dead leaves, bark, twigs, and moss, and are sometimes domed and sometimes in the shape of a cup. We call them " dreys," but perhaps you have heard them called " squaggy-jugs "—though I can't think why anyone should have given them such a queer name as that !

Baby squirrels are born in a big ball of a nest, with an opening in the side. It is so well made that even the rain cannot get at the babies.

So, with a cosy nest in which to curl up, and a goodly supply of nuts stored away in cubby-holes, the squirrel is well off in the winter. His coat, too, becomes thicker and softer, and has a greyish tinge, and his little ears grow tufts of hair, so that he looks perkier than ever.

Other Squirrels

PERHAPS you have seen the tame squirrels at Regent's Park, and in the Zoo Gardens, and wondered why they were not red like our own country squirrels. These little grey fellows are not British, but American. They used to be kept in cages at the Zoo, but their numbers grew so rapidly that some of them were set free to roam where they would. So, of course, they swarmed into Regent's Park, and there you will find numbers of little grey squirrels with unpointed ears, tame enough to run up your leg and poke into your pocket for nuts. But they will only be friends with you if you are really friends with them. You must keep still, and be gentle and slow in your movements. Then you will find that animals will treat you as a trusted friend, and few things are jollier than that.

From Regent's Park, the grey squirrels have spread outwards in a large circle, and now they can be found in woods and parks, where before only their shy red cousin could be found. Unfortunately, they don't seem to agree very well, and I feel rather sorry for the lovely little red squirrel, which seems to prefer to leave his home rather than to fight for it.

Perhaps you have heard the story of the forgetful squirrel, who simply could *not* remember where he had hidden his nuts. He sat and thought, and thought, but it wasn't a bit of good. Listen :

" I saw him by the hazel trees,
A squirrel small and still,
His fur all ruffled by the breeze
That blows on Bracken Hill.

" He scratched a furry pointed ear,
I saw him plain as plain,
He sighed so loudly I could hear,
And then he sighed again.

" He couldn't find the nuts he hid
In far-away September,
For soft he muttered (Yes, he did),
' I simply CAN'T *remember ! ' "*

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *How does a squirrel run so easily up a tree ?*

(2) *What does he like to eat ?*

(3) *What does he do in the winter-time ?*

(4) *Put down what you know about Grey Squirrels.*

(5) *Draw a squirrel's hoard of nuts.*

THE CAT

" A harmless, necessary cat."

PROBABLY most of you have cats at home—Tibbies, and Snowballs, and Blackies, and Whiskers—some black and white, some sandy, and some all black. I expect, too, you think you know a great deal about your cat, because she is so often with you. If you wanted to, you could almost write a nature lesson yourself about her, and put in it the interesting things you have noticed about your silent-footed friend.

But all the same, I think I can tell you a few things about your cat which you will like to hear, and which will make you think Puss is even more interesting than before.

A Cat's Eyes

To begin with, what queer eyes she has!

Look at them in the day-time, and then look at your own eyes. You will find that the pupil—the black part—of your cat's eyes has almost disappeared—it is just a slit of black, while your pupils are like little round black marbles.

If you look at your cat's eyes towards evening, you will see that the black slits have widened, and if you could examine her eyes at night when she roams about

the roofs, you would find that the black part has spread over nearly all her eyeball.

What is the meaning of this ? It is because cats, and their cousins, do their hunting at night-time, when it is dark, and as it is the black pupils of our eyes that take in any rays of light there are, the cat needs eyes which can make use of every scrap of light, in order to be able to see at night.

In day-time there is plenty of light, and the black part narrows to a slit ; but directly night comes the pupils enlarge to catch enough light to enable the cat to see. Of course, if the night were perfectly dark, the cat couldn't see at all, for no animal can see in complete darkness ; but there is usually a small amount of light which is quite enough for a prowling cat.

And now you know the explanation of the saying that " cats see in the dark."

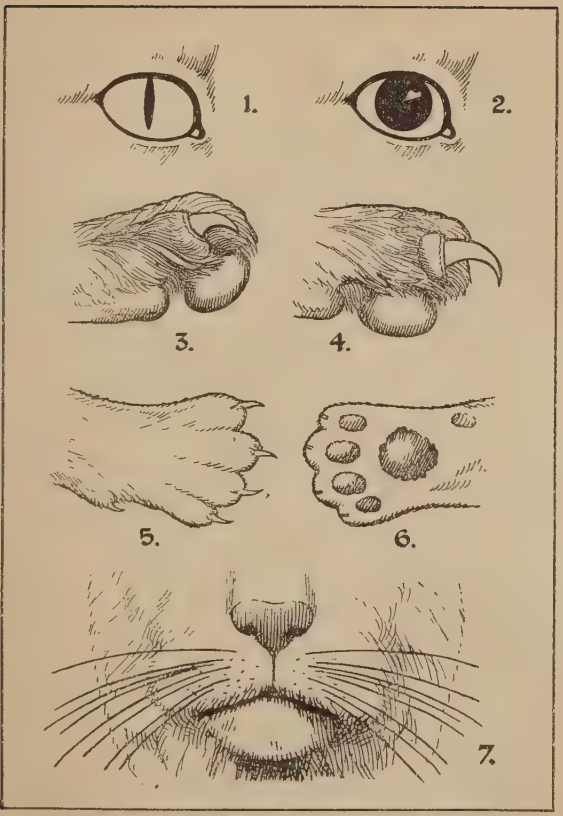
Whiskers

WHY does a cat have whiskers ?

" Oh, to make her look pretty," you might answer. I can tell you a better reason than that.

Perhaps you didn't know it, but your cat's whiskers, spreading out from either side of her face, measure from tip to tip exactly the same as the width of her body. The bigger the cat, the finer the whiskers. A thin small cat has drooping, feeble whiskers. Perhaps you've noticed that.

And now I'll tell you why. When a cat goes hunting at night, she must go silently or her prey will hear her and escape. She must make no noise of snapping twigs or rustling leaves. If she wants to squeeze through a hole in a fence, or push through a bush, she must be absolutely certain that she can



THE CAT'S EYES, PAWS, CLAWS, AND WHISKERS

1. *Eye with pupil contracted.* 2. *Eye with pupil dilated.* 3. *Claw sheathed.* 4. *Claw un-sheathed.* 5. *Back of paw.* 6. *Front of paw, showing pads.* 7. *Whiskers.*

pass through without making a noise of rustling or creaking. This is where her whiskers help her. She pokes her head through the space she wants to go through, and if her whiskers only just touch either side, she knows she can squirm through comfortably, for her body is the width of her whiskers.

But if her whiskers are bent back by the leaves or twigs, she knows that her body will not pass there without a rustling of leaves or a bending of twigs, and quietly she pulls back her head, and goes another way.

In just the same manner the tigers use their whiskers when padding their way through the jungle.

Paws and Claws

Not only must a cat's body make no sound, but her feet must be as silent as the snow. Your cat runs along the grass or carpet, path or pavement, without any noise at all. Look at the underside of her feet and you will see why. She has velvety pads under each soft paw. No mouse could hear *her* coming!

If you look underneath a dog's paw, you will find that he has pads too, but harder and rougher than the cat, for he does more running. And you will notice, too, that he makes a noise when running, for not only are his pads hard, but also his claws are rubbed continually against the ground and add to the noise.

The cat's claws are hidden. She needs hers more than the dog, for she tears her prey and defends herself from enemies with her sharp claws. The dog's are worn and blunt, but the cat's are sharp and curved. Hers do not get blunted against stones as she runs, for she can draw them back into a sheath by a special muscle—and can dart them out in an instant to scratch

at a teasing boy. As sharp as a needle they are, as I dare say you know only too well.

Tongue and Teeth

SOMETIMES, when your cat has licked your hand, perhaps because she liked the smell of it, you have said, "Oh, how rough your tongue is, Puss! It scrapes my hand!" A kitten's tongue, too, for all it looks so little and pink, feels as rough as a nutmeg-grater when she begins licking your milky finger.

If you have seen a cat eating a meaty bone you will know why the tongue is so rough. A dog will crunch up bone and meat together and swallow it. A cat cannot do that, for her teeth are different from a dog's, but instead her rasping tongue scrapes every scrap of meat from the bones, and leaves them as clean as if they had been boiled. A lion's tongue is just the same, except that it is very much rougher. If you could examine one, you would see what makes it so rough, for you would find a great number of little hook-like projections which jut back towards the throat. Each of these catches and holds to the meat, tearing it away.

A cat's canine teeth—the long ones at each side—are very strong and curved, and her back teeth—the molars—work against each other like scissor-blades. So that the cat and her bigger cousins are very well fitted in every way for the work of hunting for food, or defending themselves against enemies.

Haughty Manners

MOST children prefer dogs to cats, because the cat is so independent and haughty, while the dog is always obliging and always ready for a game. The cat will

only play if she wants to, and usually she much prefers to lie in the warmth and drowse. I always think the cat is a very grown-up animal, while the dog never seems to grow up at all.

Another way in which the two animals are very different is the way in which they eat their food. Gulp, gulp, choke! And the dog has eaten his! Nibble, nibble, nibble, lap-lap-lap, the cat will go on for half an hour! And even if the dog comes up and she knows he will gobble all her food if she isn't quick, it makes no difference. She won't hurry. You must often have wondered why.

The reason is a very, very old one. When the dog was wild, it hunted in packs. When there was food to eat, the dog who was the quickest swallower got the most, and he dared not lose a moment over his meal. To this day, he keeps his old habit, although there is plenty of time now for him to eat his meals slowly.

But the wild cat didn't hunt in packs. She hunted alone and ate alone. There was no need for her to hurry over her food. There were not half a hundred hungry animals at *her* heels. So she ate slowly, at her leisure—and still she does the same, for she cannot break her habit of centuries ago!

And, because the cat was an all-alone animal, she didn't learn to be cheerful and jolly, she didn't learn to be unselfish and faithful, loving or affectionate as dogs did. How could she, except to her own small family? She had no jolly companions to rub her rough corners off, nobody to play with and tease, so she became haughty and kept herself to herself. She did things to please herself, and put herself out for nobody.

Cats to this day are the same, and though individuals here and there are different and entirely lovable, still,

as a whole, the cat tribe have never become our trusted companions as dogs have. They are our friends, but they won't let us into their secrets as the dogs do. And the simple explanation is that the wild habits of long centuries ago make both animals what they are.

Everyone loves to see a kitten play. Like the skipping of lambs, it is really adorable, and we could watch it for hours. You watched your cat when she was a kitten, and you found out how she loved certain games.

She loved you to draw something along on a string, so that she could pounce after it. She loved to chase her own silly little tail. She would go almost mad with excitement when you ran your finger under something, so that she heard the scratching noise, and could pounce on the moving cloth or curtain.

These games are not just games and nothing else. The kitten will grow to be a cat, and will need quickness of eye, agility in pouncing, cleverness in waiting and watching. She must practise all these things to be perfect at them. And so the kitten prepares for its grown-up life by playing the sort of games which will teach it the things it ought to know later on.

For just the same reason, a cat plays with a mouse it has caught. Not for cruelty, but for practice. It lets it go and it catches it again, and so on. Nevertheless, it is not a pleasant sight to see, and one to which it is always well to put an end.

Cousins of the Cat

You can think of many cousins of the cat. Lions, tigers, panthers, leopards, pumas, jaguars, lynxes, and ocelots. Perhaps you can think of more still.

Beautiful creatures, most of them, haughty, proud, and brave. It is no wonder that the King of all the Animal Kind is to be found among the Cats, for they all have the manners of aristocrats, and the lion, with his marvellous mane and his regal bearing, is the most magnificent and beautiful of the whole tribe.

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *How do cats " see in the dark " ?*

(2) *Of what use are their whiskers ?*

(3) *Why are their tongues so rough ?*

(4) *Do you like a cat or a dog better ? Why ?*

(5) *Why does the cat eat slowly and the dog quickly ?*

(6) *Put down the names of some cousins of the cat.*

(7) *Draw what a cat's eye looks like in daylight, and then what it looks like at night. Look at your own cat at home in the morning and evening before you do this, if you can.*

HOLLY AND MISTLETOE

" Hang up the holly with berries of red,
Shining so brave and so bright,
And bring in the ivy with sturdy green leaves,
And the mistletoe, berried in white."

CHRISTMAS-TIME will soon be here again, and we shall be decorating our schoolrooms and houses with holly and mistletoe. The coral-red berries of the holly shine gaily, and the quaint-looking mistletoe, with its opaque white berries, is a symbol of love and goodwill.

What sort of a history do these plants have before we bring them indoors to make our homes gay? Holly we may have seen growing in gardens, or in woods. Mistletoe perhaps we have never seen anywhere but in the shop of a greengrocer or a florist.

It would be interesting to know a little more about them, for both of them are curious plants; the holly because of its prickles, and the mistletoe because of the way it grows. We will talk about the mistletoe first.

The Mistletoe

LET us have a good look at it. Its leaves grow in pairs, and are very tough and leathery. They need to be strong, because the mistletoe is an evergreen, and so its leaves have to face the cold winter. They

are a curious yellowish green—not a healthy colour—and you will wonder why.

It is because the mistletoe prefers to live upon the sap of other trees, instead of working for its own living, as a healthy, vigorous plant like the holly does. Plants that live upon others never look so beautiful nor so healthy as they should, and they are called parasites.

But why doesn't the mistletoe work for its own living? It is an interesting story.

You will not find mistletoe growing in the ground, but high up on trees. You may perhaps see in the winter-time a tree, an apple or a black poplar, for instance, with a curious-looking bunch of greenery sticking out somewhere from its bare branches. This will be a mistletoe plant, growing on the tree, with its rootlets firmly fixed in the branches, drawing out the tree's sap to feed itself.

"However did it get there?" you will say.

How the Birds Help

THE birds plant the mistletoe. They love the sticky berries, and often make a meal of them, though, like the holly berries, they are poisonous to us.

When they have finished their meal their beaks are sticky, and perhaps the little seeds that were inside the berries have stuck to the outside of the birds' beaks. They must clean them off. So they rub their beaks against a branch until they feel free from stickiness. Often a little seed is left in a crack in the branch, and that is just what the mistletoe wants.

Soon the seed bursts its seed-coat, and sends out a little root which curves round to the tree, and cements itself firmly on to the bark. Then it sends out a

MISTLETOE AND HOLLY

" sinker," which pierces right through the bark into the wood to find the sap that keeps the tree alive and healthy. This sap it uses for itself, and soon a pair of leaves appear, and the little mistletoe plant begins its life on its " host," as the tree is called that supplies it with the sustenance it needs.

The rootlets of the mistletoe never coil round a branch, but simply run straight up and down it. Here and there the " sinkers " are sent down through the bark, so that the roots present the form of a rake, the " sinkers " being the teeth, and the straight root being the cross-piece.

As the plant usually grows high up on its " host," you will see another reason for its leathery leaves—it is in an exposed position during the winter, when the leaves of the tree to which it clings have all fallen to the ground.

Mistletoe Flowers

THE flowers, which came before the semi-transparent berries, were green and not very conspicuous. They had no scent and were small. If you had seen branches of different mistletoe plants when they were flowering, you would have noticed that some had stamens with yellow pollen powder and no seed-box, while others had seed-boxes and no stamens. The plant which bears only stamens in its flowers never bears berries. Only the flowers with seed-boxes have berries.

Mistletoe at Christmas

MISTLETOE has nothing to do with Christmas-time really, except that it is a token of friendship, and so is hung up to tell everyone we welcome them.

The beginning of this belief in the meaning of

mistletoe dates back to centuries ago, when the Norsemen used to tell the story of Baldur, the bright and beautiful god.

Everything had promised Frigga, his mother, not to hurt Baldur—all except the little mistletoe, which had been forgotten because it grew high up in a tree.

Loki, a wicked god who hated Baldur, cut a staff from a mistletoe plant and guided the hand of a blind god to throw it at Baldur. It killed him, and there was great sorrow among the gods ; but at last Baldur was brought back to life again, and the mistletoe was given to the goddess of love to keep. Everyone who passed beneath it received a kiss, to show that it was the emblem of love and not of death, and to this day we kiss beneath the mistletoe as the Norsemen did many hundreds of years ago.

The Holly

Now let us look at the holly. How different from the mistletoe it is, with its bright green leaves, so shiny and prickly. It, too, is an evergreen, so its leaves are tough and strong, and well able to stand the cold weather.

And how prickly they are ! You can easily guess why. It is to prevent the bush from being eaten. Sheep like holly leaves, and so do deer, so the holly tree must protect itself. Besides the prickles, the leaves have a bitter taste.

You may have noticed that, towards the top of the tree, the leaves are smooth-edged and have no prickles, except one at the apex of each leaf. This is because animals cannot reach to the top of the tree, so the leaves are safe, and need no prickles.

Sometimes a gardener cuts back a holly bush.

As soon as it can, the bush puts forth new shoots and leaves, and these will be tremendously prickly, more prickly than any others on the bush. It is as if the tree thought to itself, "Oho! So some of my leaves have been eaten, have they? Very well! I'll give the animal a terribly prickly mouthful next time he comes and bites at me!"

A Pretty Bush

A HOLLY tree or bush is a very pretty sight, for its glossy leaves and bright berries stand bravely out against the snow. The birds feed on the berries when times are hard, especially thrushes and blackbirds; but, as I said before, they are poisonous to us.

The red berries are not really true berries, as, for example, are gooseberries. A holly berry is a stone fruit, or drupe, as the plum is, but has four little stones each with a seed inside, instead of just one stone.

Holly Flowers

PERHAPS you have never noticed the holly flowers. They are pretty, waxy-looking blossoms, growing here and there between leaf-stalk and twig, just where you find the berries later on. They are a soft creamy-white inside, and a delicate pale pink outside. They open in May.

The calyx cup has four green points, and inside is a white tube with four petals at the top. You may sometimes see four yellow-headed stamens, and a tiny seed-box as well, hidden in the flower tube—and sometimes one without the other—stamens and no seed-box, seed-box and no stamens, just as in the mistletoe.

Some holly trees have no seed-box flowers at all, and these are the trees which are never gay and bright with berries in the winter.

Holly Wood

A HOLLY tree grows very slowly, so its wood is hard and closely grained. As the tree seldom grows to any great height, not much holly wood is obtainable, but what there is, is used for all sorts of inlaying work. It is white and so hard that it is sometimes stained black, and used instead of ebony.

Some people say that the holly tree is the greenwood tree underneath which Robin Hood made merry with his followers in Sherwood Forest.

Holly at Christmas-time

LIKE the mistletoe, the holly has been used for many centuries for decorative and friendly purposes. The pagan Romans used to send sprigs of it to their friends with good wishes. The early Christians decorated their churches with it, and we in our time use it at Christmas to make our homes gay.

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *Where does mistletoe grow?*

(2) *How do birds help to plant it?*

(3) *Why are holly leaves prickly?*

(4) *Do all holly trees have berries? If not, why don't they?*

(5) *Tell the story of Baldur and the mistletoe.*

(6) *Draw a piece of mistletoe from a sprig in front of you.*

(7) *Look out for the flowers of holly and mistletoe in the spring-time.*

FOOTPRINTS IN THE SNOW

" *Those who pass on the fields of snow*
Sign their names in a neat little row,
And badger and rabbit, pheasant and deer,
Leave us their signatures, crisp and clear."

PERHAPS you have never tried to read the foot-writing of animals and birds in the snow. If you live in southern parts you will not have had much chance to do so, for snow does not usually lie long enough. Perhaps this winter will be a real Christmas-card one, with snow on the ground, frost every night, and ice on the ponds. You will have a good chance then to read the foot-writing of many an animal and bird, and I am going to tell you how to recognise some of the prints.

You can begin in your own garden if you like, when the snow lies covering the paths and the grass. You will not find so much excitement there, though, as farther afield, because beyond one or two cats, and maybe a dog, it is only the prints of birds you will see. If you want to read stories out of footprints, you must put on your snow boots and tramp away into the dazzling white fields outside the town. Take a note-book with you, and whenever you come to footprints quickly sketch them into your book, putting, if you know it, the name of the animal down by the sketch.

It won't take a minute, and it is great fun. You will be surprised at the different prints you will find.

A Great Game

Now, off we start, not knowing at all what we shall find. We will make our way over the fields and down by the water-meadows to the brook, which is almost, but not quite, frozen over. Keep your eyes open and notice the hedges and the trees, the ditches and the banks. If you are sharp, you may spy a few crouching birds. Snow hits them very hard, and many hundreds die of cold and starvation, particularly those which, like the kingfisher, depend on fish or insects for food.

Now we come to some tracks in the snow. Look at them, crossing and recrossing, diverging and merging. They are made by rabbits, for we can see the four little footprints continually repeated. They are in two pairs, and one pair is smaller than the other. They mark the rabbit's small front feet. The larger pair are his strong hind feet. Can you find out the direction in which he went? "Oh, yes, easily!" you say. "His front paws come first and his hind paws afterwards, so *that* must be the way he went," and you point the way you mean.

The funny thing is that that was *not* the way he went! He went in just the opposite direction. When rabbits (and hares too) lollop along, they put down their little front paws first, it is true, but then they swing their big, strong hind legs forward on each side of their front ones, so that the prints of the hind feet come in front of the fore feet. This makes it look as if the rabbit was going backwards, but he wasn't, as you will now understand.

You might think, too, that a hundred rabbits had

been crossing and recrossing the field. But probably only a few made the footprints we see. The number of them is caused by the rabbits searching here, there, and everywhere for a blade of grass. It always seems to me extraordinary that such a good digger as the rabbit doesn't try to scrape away the snow methodically, and so get at the grass beneath. But, except in a few doubtful cases, I have never seen this idea carried out.

Look at the near-by thorn-hedges. And look at that copse of ivy-clad trees. What has made the hedge-stems and ivy-stalks gleam so white and bare, like bleached bones? Well, the footprints of the rabbit lead up to them, so we are safe in saying that the hungry bunnies have made a good meal of the bark. Their sharp, gnawing teeth have stripped the stems bare.

Following the Hare

LET us follow the double pair of footsteps, rather like the rabbit's, but a little bigger, and slightly different in pattern. They are a hare's. Perhaps, if we are lucky, we shall find where he is hiding. The poor, luckless hare has no cosy burrow to go to, as the rabbit has, so he buries himself in the snow and lies there until hunger drives him out.

Look! There is his snow-house, just in front of us. Do you see that little hole in the snow? That is his breathing-hole, the space that his warm breath has made. Come round to the sunny side, and you will perhaps find that he has made himself a window to face the sun. Ah! He has jumped up, and is off, springing over the snow in fright, leaving behind him a deep set of the same sort of footprints as we have been following.

Now, what are these tracks coming suddenly out of that gap in the hedge? So neat and dapper, as if the owner was very self-confident and self-possessed. So he is, for he is a cat, and his writing is exactly like him. There it lies in a neat line, running down to the wood. I am afraid he is a poacher, for cats are not out in the fields at night for nothing.

Look at these tracks in the ditch. They are not very clear; but see, here they come out into the open. Do they belong to a small dog? They look rather like it, except that the toes are rather too pointed. Let us follow them and see where they take us. Over the field they go, and then alongside the hedge, as if the prowler were stalking something. Through the gap, and, yes—you can see them going right down to the farm buildings. Who has been nosing about the ricks and the fowl-pens?

It must have been Reynard the Fox, hungry enough to risk anything—and, look, you can see where his fine tail brushed his footprints, here and there, in a way that no dog's would. Let us follow them, just for fun.

He must have come away from the farm in a hurry, for see, here is another track of his footsteps, farther apart, and deeper. The farmer shooed him away, or shot at him. Now they run into a ditch again, and he must have crouched down, for the snow is blurred and roughened. Then they go through the hedge—and, dear me! here is where he found his supper! A covey of partridges must have sheltered in the bushes here, and Reynard jumped at them. See the broad mark in the snow, where he landed at the end of his jump. Those scattered feathers tell that he has had a good meal of some poor, frightened partridge.

Here are some extraordinary prints. Whatever in the world could have made them? They look just

as if a man, with one wooden leg, had hopped along in the snow in a straight line, with about eighteen inches between each hop. Each mark is a little bigger than a shilling. It is a regular puzzle.

Stoop down and brush away the snow round the edges of one print, and look at it closely. You will be surprised to see four tiny little footprints, bunched up together!

"But what animal hops with all its feet at once!" you will say in surprise.

Well, of course, no animal does that. What has happened is this. A stoat passed this way last night, and he knows that to go quietly and quickly he must put his hind feet down in exactly the same place as he puts his fore feet. So now you can picture him as he went along last night, looking for a pheasant for supper, bounding along quietly and neatly. If we follow his foot-writing we may come to a place where he goes slowly, and then we shall see the bunched-up prints open out into four little separate marks.

And now here we are in the water-meadows. We shall find prints of many birds here, for these meadows do not seem to freeze easily. Birds of all sorts come down to them, and moor-hens and coots do their best to find a living in the almost frozen brook.

Look at all the tracks here, there, and everywhere. It is easy to tell that they are birds'. They are thin and clear, like finger-marks more than foot-marks. This track by the hedge is a very good one. The owner must have been a very heavy bird, for see how clear and strong the writing is. Here and there the snow has been smudged, rather like the fox's track, when he blurred it with his tail. But what bird has a long, sweeping tail? Yes, the pheasant, of course! This is *his* writing, neat and firm.

His track goes to join a medley of prints, all rather like his, but not quite so large. They belong to the partridges who flew up when we came near. Mixed up with their prints is a curious track that we can see clearly here and there. See, there it is, going down to the brook. It is a straight, single-row track of a bird's foot. It must place its feet exactly in front of one another.

Look over the brook to the rushes on the other side. There is the owner of the footprints—a dapper little moor-hen, trying her hardest to find something to eat.

"But she ought to have webbed feet!" someone says. "Swimming birds have webbed feet, don't they?"

Most of them do, but the moor-hen gets on quite well without them. In fact, she is better off with the feet she has than with webbed feet, for she has to do a lot of climbing and scrambling about on water weeds and mud. Her cousin, the coot, has gone half-way to webbed feet, and then stopped. We may find her curious prints somewhere along the banks, shaped like a tiny fiddle, for each toe is lobed.

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *What animal and bird footprints would you expect to see in the snow out in the countryside?*
(2) *What little animal leaves a print like a man with one wooden leg? Why does it leave such curious prints?*
(3) *Draw a bird's footprints.*
(4) *Draw the footprints your cat might make in the snow.*
(5) *Go out in the snow at some time and look hard at all the prints you see. Try to puzzle out what made them. Make walking, running, and jumping prints in the snow yourself.*

THE ROBIN

" Sir Robin came a-courting with a bold, brave air,
And gazed at all the garden with a bright little stare."

ROBIN REDBREAST, with his bright black eyes and his smart red waistcoat, is known and loved by us all. He is attached to man, and likes to think that of all birds he is our chosen feathered friend. He probably boasts to other birds that he has a Christian name and surname just as we have, while they haven't—with the exception, of course, of little Jenny Wren. He is full of self-confidence and cheek, and is a regular little swaggerer. If buccaneers were found among birds, you may be sure our boastful little robin would be their leader ; and a very bold, bad buccaneer he would be, with a cutlass under his wing, and a tasselled cap rakishly set on his head. He can fight to a finish, and woe betide any feathered foe who pits his will against Robin Redbreast's.

The reason we love him so much is that he is so trustful and friendly. When all the other birds fly away in alarm, Robin stays behind and eyes us with a cute, knowing look, as if to say, " Silly chaps, those others ! *I'm* not afraid of you ! You're my friend and I'm yours ! "

And, after that piece of faith, how can we do any-

THE ROBIN SOMETIMES BUILDS HIS NEST IN AN OLD WATERING-CAN

thing else but encourage his advances and make a real friend of him ?

A Brave Suit

Let us look at the robin a little more closely. His orange-tawny breast makes him known at once, but, as a matter of fact, he is not the only bird which could use the name of Redbreast. The male chaffinch and the bullfinch also have red breasts, but neither of them have the perky bearing of the robin, nor such long, slender legs. The red vest the robin wears extends right up the front of his face, and where the red merges into the greeny-brown of his back is a lovely line of grey-blue. You must see if you can get near enough to look at it. He is a pretty little fellow, and has most intelligent eyes, very full, bright, and black.

The Danger Signal

We use green for safety and red for danger, and in the animal world the colour for danger is also red. The robin flies his red danger flag as a signal to his enemies that he is not good to eat. I knew a clever young cat once who caught three robins in succession, at intervals of a few days, and was each time very ill after he had eaten them. The third was enough for him. "Red birds," he decided, "are unpleasant things. In future I shall avoid them." And he did.

The robin has an Indian cousin, who is coloured red underneath his tail for just the same reason—it is a danger signal. When an enemy pursues this bird, he sees the red flashing out at him as the bird rises from

the ground—and, if he is wise, the hunter pauses before he pounces.

The Early Bird

ROBIN is very fond of worms, and as he knows that it is the early bird that catches the worm, he is up betimes, and we see him hopping about the dewy grass in the early morning sunshine. His long, slender legs come in useful then, for they raise his plumage above the wet grass, and save it from getting damp and draggled.

He goes late to bed, too, so he doesn't follow the saying, "Early to bed, early to rise." I have often had a robin for companion when I have wandered round the garden at dusk. He flitted from tree to tree as I moved, and sometimes flew down to the path right in front of my feet, as if to say, "I'm here! Look at me!"

His full black eyes help him in the dusk, for they take in every ray of light there is, and enable him to see quite well when most of the other birds are already hidden away for the night, disliking to fly about because they cannot see clearly enough.

Courting Days

IN the early spring, the robin decides to take a wife. He wants a pretty little companion, a cosy little nest, and four or five little eggs to call his own. Off he goes to look around for a nice little bride. Perhaps he sees a hen robin sitting demurely on a near-by bough, looking very shy and sweet. He perches on the branch too, puffs out his lovely red breast, and sings a ringing little melody to tell her he loves her and would like to build a nest for her.

Then, to his furious anger, before she can answer him, another bold fellow flies up and looks at his sweetheart. His rival bobs up and down and makes ready to sing a song. This is too much for our robin. With an indignant screech, he flings himself at his rival, and a battle royal is fought. The little hen robin watches discreetly from her bough, and sees the feathers fly. At last the fight is over, and she is claimed by the victor, whilst the vanquished robin flies hurriedly away to try his luck elsewhere.

The Nest

" Now where shall we put our nest ? " says Cock Robin. It is always he who decides these important questions. " Let me see—I was brought up in an old watering-can somewhere near here. Shall we see if we can find something of that sort, not too high up ? Man is our friend, and it would be nice to use something belonging to him."

So the search begins, and many places are discovered and rejected. The robin will build in holes in banks, in ivy, or old walls, but if he can do so he prefers to place his nest in something of ours. He is very loyal to man, and sometimes carries his affection to extremes. I myself have seen robins' nests in an old boot, an old kettle, and once in the inside of a garden roller ! We couldn't use it for the lawn until the baby robins had flown. Another time a friend of mine showed me a robin's nest built at the back of a bookcase in her bedroom. There were young robins in it, and whilst I was there the parent birds flew in and out of the window, with insects to feed them. Yet another curious nesting-place that I saw was on the larder shelf of a new house which workmen were

building. The parents flew in and out of the kitchen window, which the men always left an inch or two open for that purpose. The foreman said that the robins used to give them a regular welcome when the men returned after the week-end.

One of the most curious nesting-places I ever knew of was one which I heard described by a naturalist. It was in an old saucepan floating about a pond! "Let's play sailors," must have been a favourite game with the young robins in the nest.

The nest itself is usually cleverly concealed, and the outside is made to match the surroundings as closely as possible. A nest in a mossy wall will be mainly made of moss. Dead leaves will be used when the nest is on or near the ground in a wood. The outside is usually untidy and straggly to match the haphazard scattering of leaves in a wood. But inside, the nest is beautifully neat and cosy, and is made of hair, wool, and a few feathers. The eggs are four or five in number, and are white, tinged with pale grey, or very pale red, and are usually speckled with dull reddish-brown.

Baby Robins

THE little robins have no red breasts until four or five months have gone by. Their breasts are a speckled brown, and they are just as friendly and fearless as their parents. If the parents have human friends living near by, it is quite likely that they will bring their family to be introduced, and will parade them proudly on the window-sill. They are good parents to them, feeding their babies well and caring for them until they are old enough to fly.

"I've always heard that robins are *horrid* to their children," says someone, "and the father and the

children fight fiercely in the autumn. I've seen them ! "

So have I. But when you hear the reason, you will understand these quarrels better. You see, it's like this. The robin does not migrate to other countries, as many birds do. He chooses to stay with us, and to pick up what living he can. And he knows perfectly well that two robins can't make a living in one small garden. So, instead of allowing all his family to stay in one place, where they would probably be starved in the winter, he drives them away, and says each must find a beat of his own and keep to it. Naturally, the children don't want to leave the garden and the trees they know, and they resist and keep coming back. Then fights follow, and sometimes the father is driven out and sometimes the children. Even his wife has to go ; for if every robin had not a particular domain of his own, it would simply result in the race of robins gradually dying out through overcrowding and starvation. So next time you hear two robins having a fierce fight in autumn, you will know that there is a wise reason underneath all the quarrelling.

The Robin's Song

THE robin has a lovely song and sings all the year round, except at his moulting time. We hear it better in autumn and winter, because then his voice is not lost in the great chorus of song sung by other birds. His song is clear and ringing, and is a joy to listen to. In addition, he has the dearest little " whisper-song," which he uses when he accompanies you down the garden, or waits near by whilst you dig.

Anyone with a friendly feeling for birds can tame a robin. Children are wonderfully successful, and

every child should try to see what he can do with the robin in his own garden. Don't make too sudden movements, and talk to the robin quietly—then he will soon talk back and follow you about. Give him crumbs and bits of biscuits and make him come nearer and nearer. He will soon take them from your hand, or do what my robins have often done—fly down and peck a biscuit from between your teeth!

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *Where does the robin like to put his nest?*

(2) *What does he make his nest of?*

(3) *What are his eggs like?*

(4) *Why do robins fight one another in the autumn?*

(5) *Draw some eggs in a nest.*

(6) *Try to tame the robin in your garden by putting out water and crumbs in winter, and a bird bath in summer. If you have a robin in the garden, write a little description of him.*

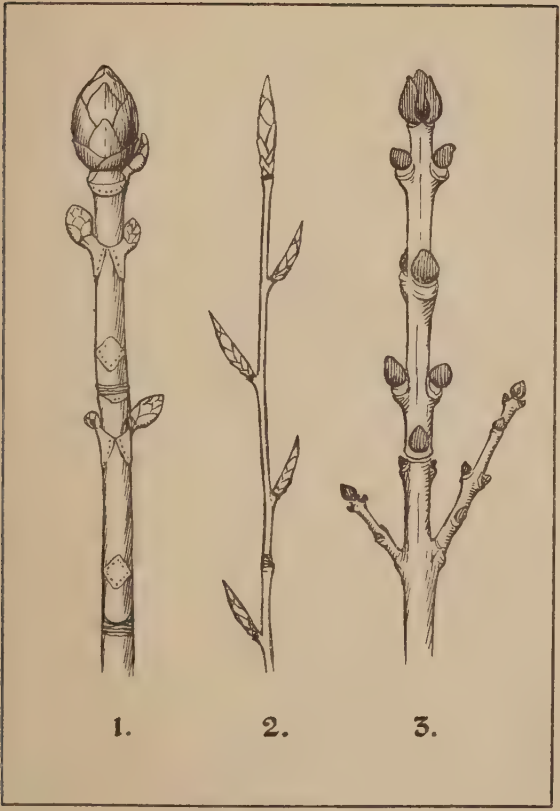
BUDS OF TREES

" If the oak comes out before the ash
The summer will only hold a splash,
If the ash comes out before the oak
The summer will go through many a soak ! "

PROBABLY most people have heard that old saying, and watch to see which tree comes out first, the oak or the ash. Usually they foretell the summer weather quite correctly ! You must watch too, this year, and see what weather the oak and the ash prophesy.

I wonder if you all know an ash tree when you see it in the winter, and could recognise an oak tree without its leaves ? Because if you can't, you won't be able to read what the trees foretell. It's so easy to name all the trees in summer-time, when each flies its own particular flag. " My flags are cut into seven strips," says the horse-chestnut. " And mine are feather-shaped with wavy edges," says the oak, while the beech boasts that hers are a lovely oval. By their leaves we know them, and can name them easily.

But to name trees without leaves is a different matter. There they stand, tall and bare, each tree's branches making a network of brown against the sky. " That's a silver birch," perhaps you say, " I can tell it by its bark ; and that's a plane, because its trunk is



BUDS OF TREES

1. *Chestnut.* 2. *Beech.* 3. *Ash.*

peeled bare in places." But after you have named two or three, you will probably come to a stop.

The Easiest Way

LET us look for the buds of all the different trees, and see what they are like. There are no two of them the same, and we can soon tell the tree to which they belong if we use our eyes for a week or two.

There is one bud you all know very well, and have probably watched opening year after year—and that is the horse-chestnut. It is a great, fat bud, sturdy and sticky, opening well in water, showing the precious treasure inside. If you have never seen one opening, you must try to do so this spring, for it really is a magical sight to watch the brown scale-coat slip off, and reveal the downy, baby leaves folded carefully up inside.

What is a Bud ?

"WHAT exactly is a bud ?" perhaps someone asks. "Is it just a little crowd of leaves waiting to open ?"

It is more than that, as you would see if you watched the growth of one special bud on a tree for four or five months. First, you would see the tiny bud in its tight coat of scales. Then as these open, out come the baby leaves, to spread themselves in the spring sunshine. And then you would see something else—you would see that the short, squat stem inside the bud, from which each baby leaf springs, is lengthening out, so that the distance between each leaf is widening—and little by little the stem grows, until you find it hard to believe that the sturdy twig you see, with its green leaves neatly separated from each other by a stretch of brown stem, was just a few months ago a

tiny, short bud, squatting on a stem. The separation of the crowded-up leaves means that each can now obtain enough light and air, and is in no danger of being suffocated by the others.

The Arrangements of Buds

TREES arrange their buds in different ways along the stem. The horse-chestnut grows its buds in pairs, and generally each pair is placed at right angles to the next pair. There is always a bud at the end of the branch, and this is called the terminal bud. This right-angled arrangement of buds is to allow the sunlight to find its way equally to all leaves. Some trees do not grow their buds in pairs, but singly, like the beech. Then, as you will guess, the tree arranges its buds alternately, one each side of the stem, and when the leaves unfurl they find they are well placed for sunshine and air.

Other trees prefer to arrange their buds spirally round the stem, each bud a little farther to the left or right, until the third, fourth, fifth, or sixth bud, as the case may be, is placed exactly over the first one, farther up the stem.

Bud-scales

IT is not difficult to guess why the tiny leaves need a scaly coat to protect them. They were born the summer before, so they have a long while to wait before their time comes to open, and they need some protection against damp, cold, or frosty weather. This protection the bud-scales give, for they are tough and damp-proof, and, in the case of the horse-chestnut, so sticky that no bad weather, insect, or bird can hurt the young leaves within.

Most of the bud-scales fall off once their work of protection is done, but sometimes a curious thing can be observed. Occasionally the inner green scales of the horse-chestnut, for instance, will develop leaf-blades at the tips, and we can watch the growth of small leaflets. This shows that the bud-scales of the horse-chestnut are really leaf-bases, which have had their leaf-blades suppressed in order to form a strong scaly coat for the inner leaves and flower. When their work of protection is done, these scales sometimes revert to their true selves, and therefore develop, as described above, leaf-blades at their tips. The sycamore bud-scales can also sometimes be seen with a tiny developing leaf-blade. Other trees use their stipules (outgrowths of the leaf-base) for bud-scales. This can be seen in the case of the beech. In most trees, the outer leaves are modified into bud-scales.

How to Recognise Buds

Now we will take a few well-known trees and talk about their buds. We don't need to say much about the horse-chestnut, for we have already spoken of it two or three times. It is a lovely bud to keep in water, because it opens so beautifully—first the brown scale-leaves, then the tiny finger-like leaves, wrapped in a blanket of down, and last of all, if the bud is a terminal one, a pinkish-white bundle in the middle—the chestnut flower. We must not forget to look, too, for the horseshoe scar, left by last year's leaves.

The ash buds we can easily recognise, because they are so dark that they look black. They are hard, solid-looking buds, and it seems impossible that they should contain the soft feathery leaves with which the tree is clothed in summer. They are arranged in

pairs, each pair at right angles to the next one. Down the stem you will find the scars left by fallen leaves.

The oak has an untidy jumble of buds. You will see some clustered all together on the top of each twig, and some arranged spirally down the stem, and then another untidy cluster. They are brown and sturdy, and, like the ash, open late in the year.

The sycamore tree has a very large terminal bud at the end of each twig, and smaller buds grow along the sides. The big end buds are called " cocks," and the small buds are known as " hens," as I dare say many country boys and girls could tell. The " hens " grow in pairs at right-angles to each other. If you take a sycamore twig and put it in water, you will see that, when the buds open, all the baby leaves are folded like tiny fans.

The plane tree has a clever way of protecting its buds. Each leaf stalk is hollowed out at the base, making a little cup, which exactly fits over next year's bud. And there the bud hides, safe and sheltered, until the leaf falls and it has to face the winter. It is provided, by that time, with a coat of reddish scales.

The beech has long slender buds, brown and pointed, each well wrapped in a coat of brown scales. They are arranged singly and alternately on the graceful twigs, and inside can be found the baby leaves folded, as in the sycamore, into dainty little fans.

The lime tree has small, oval buds, ruby-red in colour. When the red scales fall in early summer, the emerald-green leaves open out, pale and beautiful. " A million emeralds spring from the ruby-budded lime," sang the poet, and his description is one you can pack away into your memory.

The elm buds are tiny, and the twigs bear many bead-like flower buds, which open early. The buds of

the graceful birch are also tiny brown things, holding the fairy-like leaves which the birch tree flutters in summer-time.

The poplar's buds are dull crimson and sharp, and you will find them arranged singly and alternately down the stem, just like the beech buds.

Something to do

Now I have told you how to recognise ten trees. The next thing to do is to go out and find them. When you have found them, bring them home and put each different twig in a jar. Paste on the jar the name of the tree that you think the buds belong to. When the buds open and show you their leaves, you will know whether you are right.

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *How can you tell one tree from another in the winter-time?*

(2) *What do you know about the horse-chestnut bud?*

(3) *Are all buds arranged in the same way? If not, put down two different arrangements.*

(4) *Why do some buds have scaly coats?*

(5) *How can you tell* (a) *ash buds*, (b) *chestnut buds*, (c) *beech buds?*

(6) *Draw two different tree-twigs with their buds.*

(7) *Next time you are out walking, collect some twigs and bring them to school to find out their names.*

FLOWERS OF TREES

" There's hidden treasure in the wood ;
And I am going to see
If I can make the forest give
Its secrets up to me ! "

I WONDER if you know what the hidden treasure is. I will tell you if you can't guess. It is drops of ruby rain, little purple brushes, silvery pearls, and many other beautiful things. But you won't find this treasure buried in the ground, so it is no use to go about looking downwards. You must look upwards, and then you will see it—for it is the flowers of the trees. Then the elm will show you its drops of ruby rain, the ash will give you some of its wee purple brushes, and the willow will offer you its silvery pearls.

Unless trees have big flowers we don't notice them. We all know the horse-chestnut's lovely pink and white candles, the laburnum's golden rain, and the almond blossom's sunset-pink. We can't help knowing them, because they are so big and so brightly coloured. But perhaps it has never occurred to you to wonder whether all the other trees have flowers too. What about the oak ? We know its acorns, but do we know the flowers the acorns grew from ? And the beech—does anyone know what its flowers are like, or even if it has any flowers at all ?

Yes, the beech has flowers, and all the other trees have flowers too. If there were no flowers, there would be no baby trees, so, of course, the big trees must have flowers. In this story I want to talk about the tree flowers you can find and examine for yourselves.

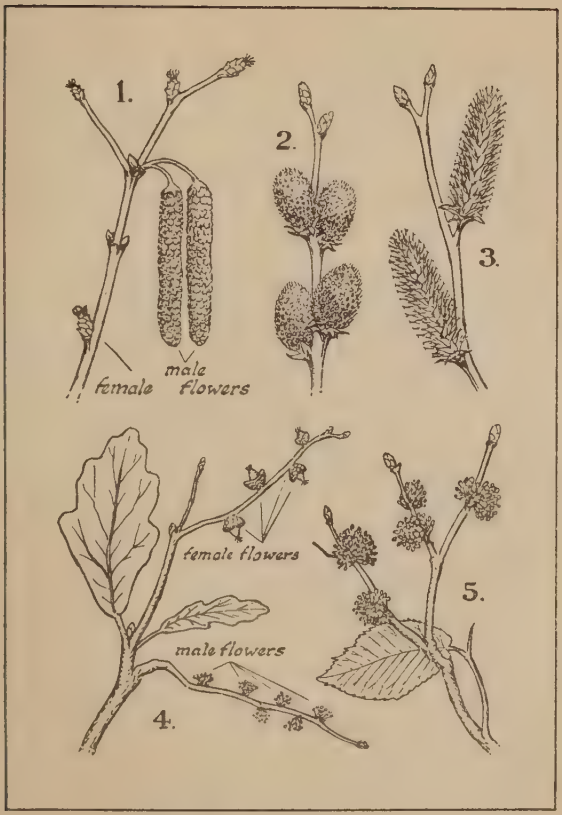
The Beauty of Tree Blossoms

BEFORE you notice the quaintness and the queerness of many of these unfamiliar tree blossoms, I want you to notice the beauty of them. Most of them are small, but in their colouring, way of growing, and daintiness, they are fairy-like and lovely. They are like ornaments put on to adorn the bare twigs and boughs of the tree.

I should like to take you all to Cuckoo Wood, and along Cuckoo Lane, when the elms are blossoming, when the hazels are decked with golden lambs'-tails, or when the Lombardy poplars are flinging their crimson catkins down to the ground. But I can't do that, so you must just keep your eyes open, look at all the tree flowers you can spy, and pick up all the discarded blossoms you can find below the trees.

Misty Trees

IN December, when no trees blossom, the distant woods and solitary trees look bare, and are clear in outline against the frosty sky. But as soon as the shortest day is past, and the sun begins to set later, and give us longer days, a change comes over the landscape. Little by little, the woods change colour; little by little, the trees become more graceful, more pliable, and softer in outline, until at last they seem from a distance to be standing in a pinkish-blue mist, warm and living, promising more beauty as the



FLOWERS OF TREES

1. *Hazel.* 2. *Male Willow flowers.* 3. *Female willow flowers.* 4. *Oak catkins.* 5. *Elm flowers.*

days go on. This gradual change is largely due to the swelling of the buds, and also to the blossoms opening on many of the trees. The elms, for instance, make a lovely network of blossoming twigs against the sky, and seem to be clad in a crimson mist. This slow coming of soft colours to woods and hedgerows should be watched for—it marks the close of winter, and brings the golden-green spring nearer.

Big Trees and Little Flowers

It is a curious thing that the biggest trees seem to have the smallest flowers. The oak, for instance, has very tiny flowers, and so has the beech. Smaller trees, on the other hand, often have big or showy flowers—the laburnum, the hawthorn, with its bright masses of blossom, the apple, and the pear.

Some trees flower before they unfurl their leaves, others flower at the same time or afterwards. You can, perhaps, think of reasons for this. Those flowers that are mainly pollinated by the wind prefer to blossom before the leaves come, so that the pollen is not hindered in its flight by the leaves. Those that are pollinated by insects often flower after the leaves come, relying on their colour and smell. If, however, they have not much smell, or none at all, and are not very showy, then they flower before the leaves, in order to give themselves a better chance of being visited by insects.

A Curious Thing

We are used to flowers which have both stamens and seed-boxes, such as the poppy and the dog rose. We know that the pollen of stamens is necessary to help to make good seeds in the seed-box, and that

each flower prefers to have the pollen from *another* flower's stamens rather than from its own. If it does, its seeds will be hardier and healthier than they would be if they were self-pollinated.

Now many trees make quite a point of this—in fact, they are so keen to have strong, sturdy seeds that, to prevent self-pollination, they will even go so far as to grow two different kinds of flowers on their twigs—one kind with stamens and no seed-box—the other kind with seed-box and no stamens. The hazel tree does this, and you will be able to find its bunches of flowers with stamens (the catkins) and also its tiny crimson seed-flowers growing separately on one stem.

Some trees go even further—they grow only one kind of flower, either the flower with the stamens, or the flower with the seed-box. The willow does this, and on one willow you will find only staminate flowers (stamen-flowers), while on another you will find only seed-box flowers, so that the seeds *can* only be fertilised by cross-pollination. Holly trees sometimes do this, too, which explains why some bushes never bear berries. They can't because they have no seed-box flowers. (See Lesson on Holly and Mistletoe.)

Flowers to Look For

Now I will tell you a few tree flowers to look for. First of all, see if you can find the elm flowers. You will know the tree by all the brushwood growing around its trunk. Its flowers are crimson, and grow in tufts along the twigs. You will see them showing bold and brave against the sky, if you look up into the tree. Pick up a fallen spray if you can find one. You will see first of all a mass of crimson stamens

with big purple heads. Pull a flower bunch to pieces, and see if you can find the little purplish case in which the stamens grow, and discover where the tiny oval seed-box is.

The hazel, another tree early in flower, is easily examined. The long yellow catkins are a mass of little stamen flowers, and if you shake these " lambs'-tails " you will see the pollen fly. The wind carries this pollen to the starfish-like red spikes growing along the twig. These, as we have just said, are the female, seed-box flowers.

The oak flowers later, about the same time as the leaves unfurl. It has catkins of two kinds. One is a slender hanging catkin, tufted with small bunches of yellow-headed stamens. You will find sepals among them, too, if you look, but no petals. Growing on the same branch, you will see an upright sturdy catkin, carrying a few wee cups made of bracts. Each cup contains a seed-box, which is crowned with three points (stigmas). You will guess, of course, that when the seeds in the boxes are pollinated the acorn begins to form and the cup develops, until in the autumn-time we see fat acorns on every twig, sitting cosily in their strong cups.

To describe the willow flowers properly would take too long, so I must just be content to tell you a little about them, and you must examine them closely for yourself. There are many willows, but you probably know the Goat-Willow best, because of its use on Palm Sunday. You will know its silvery pussy-buds, and you will know the glorious golden-yellow catkins that develop as the bud grows larger. But perhaps you didn't know that the tree on which you find these golden-yellow catkins is a " stamen-flower " tree, and cannot make seed. To find the

seed-box catkins you must look on a near-by pussy-palm tree, and there, maybe, you will find grey-green catkins, with green pistils instead of yellow stamens. Bees help the willow in its pollination, for they come for the honey, and carry the pollen from one catkin to another.

The ash flowers are quaint little things, coming before the leaves. They open out in little purplish tufts on each side of the twigs, and consist of bunches of purple-headed stamens, and tiny bottle-shaped seed-boxes of green. You may, perhaps, find no seed-boxes at all, only stamens, and then you will know that that ash tree will bear no seeds.

The beech bears its flowers when the leaves unfurl. You will find two kinds here again. The seed-flower grows upright on a short stalk and is a bristly ball, waving six threads (stigmas) in the air. The stamen-flower is a pretty little tassel of purplish-brown, yellow-headed stamens. It hangs down on a long drooping stalk. When the pollen has reached the seed-flowers, seed begins to form, and in the autumn Master Squirrel hunts for the little nuts in the prickly seed-box.

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *What are the flowers of the hazel tree like?*

(2) *Choose two other trees and describe their flowers.*

(3) *What do you know about Pussy-Palm?*

(4) *Draw the flowers on either a hazel twig or a willow twig.*

(5) *Bring some elm-flowers to school. You will find them fallen in the road on a windy day.*

THE LITTLE COLTSFOOT

" Scores of elfin pennies lie
Forgotten, all about,
Their faces to the cloudy sky,
To watch the sun come out ! "

IF you have been walking about the fields and lanes lately, you will know what the elfin pennies are, for here and there along the banks and beside the fields, you will have seen the yellow coltsfoot shining like little bright pennies. You must have noticed it at once, because it is the earliest flower to come out. The dainty celandine comes a little later with its polished golden cups, outshining the quaint coltsfoot, but for a while the little flower reigns in the fields and on the railway embankments, like a yellow-crowned king. When the other spring flowers come out, the coltsfoot is still blooming, but it is lost among the brilliance of the rest.

A Quaint Plant

LET us have a close look at the plant. It is so sturdy and stiff-looking that it has almost the appearance of being artificial. It grows straight up from the ground on a thick, scaly-looking stalk, and many blooms spring from the same patch of ground. In fact, the

THE LITTLE COLTSFOOT

Leaf, rootstock and flowers. 1. *Ray-floret with Stigma.* 2. *Disc-floret with stamens.*

coltsfoot sometimes covers a piece of ground or a bank so thickly that it looks like a sheet of gold, especially if one sees it when passing by quickly in a train.

What flower is the coltsfoot rather like? "That is an easy question," you will say. "Why, the dandelion, of course!" It does look rather like a miniature dandelion, and it belongs to the same family, *Compositæ*. Are its leaves at all like the dandelion's toothed leaves?

Ah, look as you will, you won't find any leaves just yet. The coltsfoot says, "One thing at a time, please," to its flowers and leaves. First come the flowers, and then come the leaves, and you must look later on for those, when the flowers are withered. The coltsfoot has a good reason for this, as you will hear later.

The Strap-shaped Ray-Florets

LIKE the dandelion and the daisy, the coltsfoot likes to mass a great many tiny flowers or florets together on one head. Look at your coltsfoot closely, and you will see that instead of being one simple flower like the buttercup or wild rose, it is a mass of tiny flowers all neatly arranged round in a head. You will notice something else, too—you will see that the florets in the centre are different from those outside.

Pull two or three of the outer ones from the head, and have a look at them. You will find that each has a seed-box below, then a circle of hairs, which is really the calyx (sepals) transformed, then a strap-shaped corolla (petals), and, lastly, a stigma with two lobes. The strap-shaped corolla forms a little tube before it widens out into the long yellow strap, and through

this tube the style grows, bearing the stigma at the tip. The style has also a brush of hairs to brush pollen out—but can you find the stamens ?

No, you can't—for these strap-shaped florets have no stamens, though maybe they did have, once upon a time, and then they must have found their pollen brush useful. These florets can only make seed when the pollen from another floret reaches them, for they have none of their own.

The Tubular Disc-Florets

And now we will find where the pollen comes from. Take out two or three of the centre florets, and have a look at them. They are quite different from the ray-florets. They have no long yellow strap, but instead they have a tube-shaped corolla with five teeth at the top. You will see the hairy calyx below it, just as you saw in the other floret. And now look at the stigma—there it is jutting out from the tube—but it is not alone, for around it are five stamens joined together by their anthers. It is from these that the pollen comes. The style has a pollen brush, as had that of the ray-floret we saw, but the stigmas of these inner disc-florets cannot hold pollen, so that no seed is made by them. Only the ray-florets make seed.

The coltsfoot florets thus show an interesting division of labour. The outer ones attract insects and make seed. The inner ones provide the pollen, but cannot form any seed. The ray-florets are usually open before the disc-florets, and this means, of course, that they will probably be pollinated by bees or beetles coming from another flower. If, however, they are not, the flower heads can pollinate themselves,

for they close up every evening, and, in pressing the ray and disc-florets together, some of the latter's pollen is sure to get smeared on to the stigmas of the outer florets.

Insect Visitors

The disc-florets secrete honey for the bees. If you hold one of these florets up to the light you will be able to see it showing yellow through the corolla tube. Beetles visit the coltsfoot, too, and take the pollen. In taking it, they help the ray-florets to make their seeds, for they accidentally press the pollen on to the stigmas as they creep over the flower head. Flies also visit the coltsfoot, so that it has plenty of friends and helpers.

Bracts and Stalk

Look underneath the flower head, and you will see what protected the bud. You will find a single row of bracts which acted like a waterproof coat before the flower opened.

The flower stalk is very thick, and is covered all the way up with purplish scale-like bracts, which are very hairy indeed. In cold weather, or when it is raining, the stalk droops so that the flower head hangs down and does not get its florets spoilt. When the sun shines, the stalk stands erect, and the flower opens and looks towards the sun.

After the flower has withered, the stalk droops once more, and the head hangs downwards until the seeds are formed. Whilst this is going on, the stalk grows. When the seeds are ready to be blown away, the stalk stands erect again, taller than ever, so that the baby seeds, with their parachute of hairs, can go sailing

safely away above the grasses which might have entangled them had the stalk been short.

The seeds are in the shape of a clock, rather like that of the dandelion, but smaller and not so beautiful.

The Underground Stem

How is it that the coltsfoot can flower so early, and need not bother about leaves? The reason is that it has so much food stored away in its underground stem, that it can easily make flower shoots, and feed itself without bothering to grow leaves to work for it.

If you dig up a coltsfoot, you will see its sturdy underground stem, or rhizome, as we call it. This bores it way through the earth, growing thicker and woodier, sending out branches here and branches there. From it spring a number of roots.

In this stem is stored the food on which the flower shoot feeds and thrives. It has quite enough without needing leaves to supply it with more, so none are grown at first. Also, there might not be enough food to feed both flower shoot and young leaves. But afterwards, when the flower is withered, and its work is done, the underground stem needs another store of food for the next year's flowers, and accordingly sends up leaves to work for it, and prepare food from the sunshine and air to store in the stem below.

So up grow the leaves, and are soon hard at work getting food to store away for the next year.

The Leaves

I WONDER if you know the leaves of the coltsfoot. If you don't, you must look out for them. You can guess what they look like, for the flower was named

after the shape of its leaves. They are roughly in the shape of a colt's footprint, and are broad and thick, with dark teeth. Underneath, they are white with woolly hairs.

When the leaf first appears, white cotton-woolly down covers both the upper and under surfaces. As the leaf grows and spreads itself out, the down disappears from the upper side. It is not needed there, but the leaf still needs it underneath to protect the lower surface from the damp of the moist ground in which it grows.

A Wonderful Little Flower

ALTHOUGH the coltsfoot seems such an ordinary, common little flower, it has, as you see, a most interesting story. It is a wonderful little plant, with its two sorts of florets, its sturdy underground stem, and its hard-working leaves. You must look out for the seeds later on, and perhaps you will see someone else looking out for them too—for Mr. and Mrs. Goldfinch say there is nothing like the little hairy parachutes for lining a nest! They would rather have those than anything.

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *What do you know about the flower of the coltsfoot?*

(2) *Why is it called coltsfoot?*

(3) *What kind of seeds does it have?*

(4) *How is it that the coltsfoot can flower so early?*

(5) *Draw a coltsfoot flower from one in front of you.*

(6) *Find out when you go walking* (a) *what kind of place it grows in, and* (b) *what its leaves are like late in the spring.*

THE FROG

" ' I don't like frogs,' said a tadpole small,
' They're ugly things, with a croaking call ! '
A frog nearby gave a ' ho ! ho ! ho ! '
But he wouldn't say what had amused him so ! "

I WONDER if anyone has seen the frogs yet this spring. They are waking up from their winter sleep, stretching themselves, and thinking how nice it will be to sport in the pond on a sunny day. They have slept all winter at the bottom of ponds and ditches, in marshy fields, and other moist places. If you had found one whilst he was taking his winter sleep, you would have thought he was dead—for he would have felt so cold and lifeless.

But when a ray of warm February sunshine or a bright March sunbeam strikes him as he lies sleeping, something stirs in him, and the spring-time calls him again. He wakes up, and gets his stiff limbs into working order. Then off he goes, scrambling and leaping, to find his pond. Or if he has been asleep in the mud at the bottom of the water, he rises to the surface, and suns himself deliciously until he feels ready to face anything, and croaks hoarsely.

Frog Spawn

Now is the time to look for frog spawn. You will find it in practically every pond, and you can't mistake it, for the frog lays her eggs in a mass of jelly that

soon floats to the surface. At first the little black eggs, each cased round with slippery jelly, lie small and unheeded at the bottom of the pond. Then, as the jelly swells, it rises to the top of the pond, where the sunshine can warm it, and hatch the eggs far more quickly than if they were lying on the cold bed of the pond.

Can you think why the eggs are wrapped up in jelly ? I expect you can. The jelly is so slippery and tough that it protects the eggs from being eaten. A slippery mass like that would be hard to get hold of and very difficult to eat with enjoyment. Ducks, however, are fond of it, and will eat all they can find. Their broad flat bills enable them to gobble up the spawn quite easily. In fact, you are not very likely to find frog spawn in any pond where ducks swim. They will have found it first !

The eggs are black, because that colour attracts more heat than any other. This means, of course, that the eggs will hatch out as quickly as possible. The jelly also prevents them from getting mouldy, and spaces out the eggs so that light and air may get to each one.

The Tadpoles

If you keep a piece of frog spawn in a jar, and watch it, you will see that the little round black centres soon begin to alter their shape, and become longer. Then one day out come, not tiny frogs, but queer little black things, all tail and head—the tadpoles we know so well. Some country folk call them " tailed-polls," which means " tailed-heads," and probably this explains how they came to be called tadpoles.

They are very lively, and wriggle about here, there, and everywhere, till the water seems quite black with

THE LIFE STORY OF THE FROG

1. *Eggs.* 2. *Eggs just before hatching.* 3. *Tadpoles using suckers.* 4. *Their gills appear.* 5. *The tadpoles develop.* 6. *Hind legs appear.* 7. *Front legs also.* 8. *The tail shortens, and the tadpole becomes a young frog.*

them. But for all their liveliness, many of them are eaten by the other pond-dwellers.

Babyhood

If you have a piece of water-weed in your jar, you will see the little tadpoles hanging on to it in rows. They are not eating it, but merely using it as a resting-place. They have no proper mouth at first, and they do not need one, because they feed on the yolk-sac inside their bodies, and this keeps them going until their mouth is ready to help them. They cling on to the water-weed leaves and stem, by means of tiny suckers underneath their heads.

After a while their mouths develop and are ready for use, having inside a little horny plate, to help the tadpoles to eat the leaves of the water-weed. They feed greedily then, and rapidly grow bigger.

The next thing that happens is the appearance of tiny gills from each side of the tadpole's head. You can watch these growing if you observe the tadpoles in your jar. You will find it interesting, too, to keep a little tadpole diary, putting down each day what you see happening in your jar, and making little drawings as the tadpoles grow and change. The gills look like tiny branches, and the tadpole uses them for breathing, just as fishes do. But he is *not* a fish, for he has neither scales nor fins.

After a time, these gill-branches are hidden by a gill-plate, which covers them completely.

Growing Up

The tadpoles grow thicker and stouter as they feed, and one day you will notice little black things jutting out behind their heads. These are its growing hind

legs. The front legs, too, are growing, but as these are at first hidden by the gill-plate, you will not notice them until a little later.

Now the tadpole is really growing up. He is leaving babyhood behind and becoming a frog. As his hind legs and front legs grow, his long tail becomes shorter and shorter. It doesn't drop off, as you will hear some people say ; it just grows shorter, and you can watch it happening. Every day the tadpoles look more and more like little frogs, and you can watch their tiny toes lengthening on each foot. You will notice that the hind feet are webbed to help in swimming, but you will see that the four fingers on each of the two front feet are free. You can easily show these interesting little facts in your drawings.

A Land Animal

ANOTHER change is taking place in the young frog's body. He is going to become a land baby, and needs *lungs* with which to breathe the air, instead of gills. So his gills disappear, and lungs develop inside him. His eyes begin to stand out from his head, like the eyes of all mature frogs ; his tail disappears altogether ; and one day he hops on to a floating log and stares proudly down at the pond beneath, no longer a water-baby, but a land-baby—a real, proper frog !

A Fine Time

Now the baby frog has a fine time. He plays about in the pond and in the shallow edges, and thoroughly enjoys himself. But sooner or later, he must leave his playground and start off on a voyage of exploration. He must travel over fields and meadows, and across

lanes and ditches, till he finds a place in which he thinks he would like to stay, and where insects and grubs may be found. The baby frogs usually set off after a heavy rainfall, when there is plenty of moisture about. A departure from wet pond to dry, sun-baked fields would not be good. This explains why, after a rainfall on a summer day, the country walker sees, to his amazement, little frogs hopping everywhere around! I have seen them myself, and felt almost like agreeing with my child companion when he said that the rain "couldn't have been rain, it must have been frogs!"

The Grown-up Frog

THE grown-up frog is a queer-looking creature, with eyes that jut out, huge mouth, and a squat brownish-green body. His clammy skin has had to be cast off many times before he reached maturity. When he changed it, he rolled the old skin into a ball, popped it into his mouth, and ate it! He can change the colour of his coat to match his surroundings, and this helps him to escape his enemies. The reason he feels so moist and clammy, when you pick him up, is that he has skin glands in his body which exude moisture to keep his skin damp.

A Cold-blooded Creature

THE frog is cold-blooded. This means that he is just as warm or as cold as the atmosphere is—his body does not keep at one temperature as ours does. You can well imagine that in winter he becomes so very cold that he has no energy to do anything at all. He can only fall asleep and hibernate.

His tongue is fixed into the bottom of his mouth in

front, not at the back, as ours is ; so he can put it out much farther than we can. It is very sticky, and he uses it to catch flies. He flicks his tongue out and in again—and the fly has disappeared !

His powerful hind legs help him to escape his enemies in two ways—he startles them by his sudden leap into the air, and before they can say " Jack Robinson," or whatever animals say, those same long legs have landed him safely into a hiding-place.

Amphibians

You will know one of the frog's cousins very well—the toad. He, like the frog, is an amphibian ; that is, he is first a water and then a land animal. You will recognise him by his eyes, which are like beautiful precious stones.

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *Why are frog's eggs wrapped in jelly?*

(2) *Say what you know about tadpoles.*

(3) *What do they grow into, and what becomes of their long tails?*

(4) *What do frogs do in the winter?*

(5) *What do they eat in the warm weather, and how do they catch their food?*

(6) *How do they escape from their enemies?*

(7) *Draw a frog's egg ; a young tadpole ; and an older one.*

(8) *Get some spawn and keep it at school in a jar to watch the tadpoles develop and grow.*

THE MOLE

" I hunt for grubs, and I chase the worms,
I make all the beetles run,
I live all day in the dark, damp ground,
And seldom I see the sun."

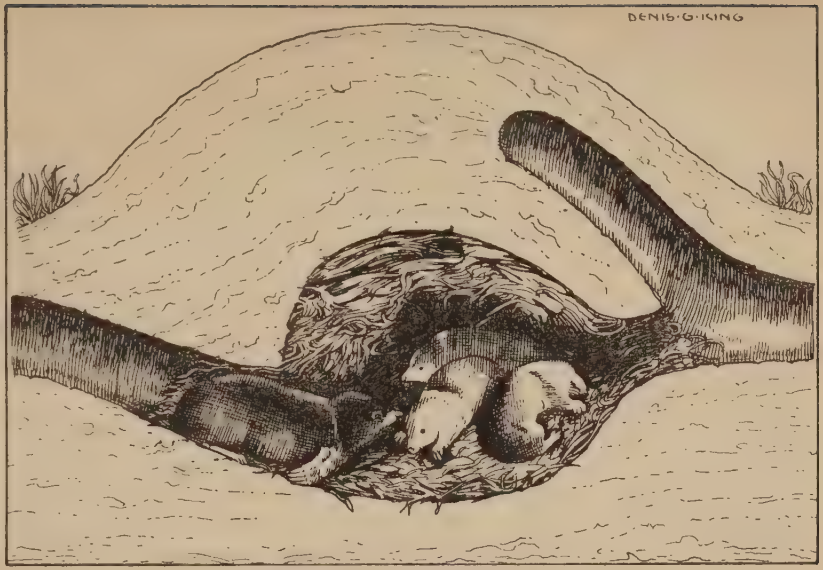
HOW many of you have seen a mole ? If you are country dwellers you will almost certainly have seen one of these queer underground animals, and will be able to tell of the hillocks and ridges that the little miner makes across the fields.

He is a very clever miner. He can tunnel rapidly through the earth, and yet he takes no tools with him as real miners do. He grows his tools on his body, and that is most useful—for he can't very well lose them then.

The mole's body is cylindrical in shape. A submarine is cylindrical in shape, and so are cartridges and torpedoes. All of these have to bore through something—the submarine bores its way through water, and the cartridge bores it way through the air. The mole has to bore his way through the earth, and so he has a body properly shaped for boring. His head is tapering, just as a torpedo's is, and he can get along through the earth at a tremendous speed, helped, of course, by his strong front paws.

A Lost Mole

I ONCE met a poor, wandering mole by the roadside. It was a warm day in a very hot summer. The



THE NESTING HILLOCK OF THE MOLE

land had dried up and was hard as iron. The poor mole found that even *his* strong paws were not equal to tunnelling in it, so he came to the surface and flopped about in the ditch trying to find food. I picked him up, and had a good look at him. He was evidently half-starving, for his struggles were feeble.

He was not a beauty—no animal with a body shaped like his could be. His snout was long and strong and flexible. His front legs were very short, and were so far forward that they seemed to be fastened to his neck.

" Aha ! " I said, " I can see how it is that you get along so well underground, Mr. Mole. I've never seen such strong feet as yours ! "

As I spoke to him, he waved his strong front legs in the air, as if to show me how he used them. They were spade-like, covered with horny skin that would prevent any stones or flints from cutting his feet as he dug. His claws were stout and strong, and he used them, when in the earth, like a pickaxe and spade combined, tearing the earth away and then flinging it upwards. So used were his paws to this, that they grew palm outwards, which made it very difficult indeed for him to walk above ground.

His back paws were smaller, and more like an ordinary animal's feet. His tail was a ridiculous little thing—but as a mole would find a long one decidedly in the way, I dare say he was quite content with his own tiny one.

A Velvety Coat

His coat was very soft, and felt and looked like grey-black velvet. It didn't matter which way I stroked it, backwards or forwards. It had no backward " set "

like a cat's or a dog's—and this, if you think a little, is a good idea for an underground animal. When he wants to go forwards quickly his fur conveniently lies backwards. If he meets an enemy and wants to go backwards even *more* quickly, his fur at once lies forwards, and so enables him to slip through his tunnel without any discomfort.

His eyes I could not see, nor his ears. This was not to be wondered at, for he has no outside ears, though he hears keenly enough for all that. He would find it a nuisance to keep the dirt out of external ears if he had them, so he goes without. His eyes, however, were there, but so hidden away in his thick fur that I really couldn't find them.

I once asked a mole-catcher if *he* had ever seen a mole's eyes when it was alive. He smiled and said yes, and if I liked he would show me them plainly. The next day he brought me a live mole. He plunged it for two seconds in a rain-water butt and *then* I saw the mole's eyes. Tiny, tiny things they were, set deep in its fur. They can be of no use to the mole in his underground work, and very little use when he is above ground.

To make up for his hidden eyes, however, he has very good hearing and a keen sense of smell, and these two things help him to satisfy his enormous appetite.

A Hearty Eater

THE mole is for ever hungry. He eats earthworms, beetles, grubs, and chrysalids, and sometimes attacks frogs, lizards, or small birds for a change of food. He is also fond of slugs and snails. As most of the food he eats does not contain much nourishment, he is never really satisfied, and is one of the busiest little creatures

in the animal kingdom. He must rid the ground of hundreds and hundreds of harmful grubs and insects.

The Vanishing Mole

At one time I lived on a farm surrounded by land which was simply infested by moles, and I used to play a little game with them. I would take a book and sit down in a corner of a meadow and watch out of the corner of my eye for any movement round about. Presently, if I were lucky, I would see the working of a mole, and might see him come up to the surface. Then the game was to rush over to him before he disappeared again. But, do you know, I never once managed it. Each time when I arrived where he had been a few seconds before, he was gone! It seemed almost as if he had sunk into the earth, so quickly had he dug himself in again. So I did not once win that game.

You must often have seen the mole's handiwork—or rather footwork—in the country. As he tunnels, he throws up the earth into hillocks, with ridges between them. You will have seen them *very* plainly if Master Mole has taken it into his head to do a little tunnelling across a tennis lawn. He makes himself a great nuisance then.

Most farmers hate the mole, and destroy him whenever they can. They say he ridges their fields so that it is difficult to cut hay, and often the little creature roots up young corn with his tunnelling. On the other hand, he certainly clears the ground of a great host of pests, such as leather-jackets and wireworms, which, if left in the ground, might destroy the crops.

Another way in which the mole helps the farmer is

by turning up the soil for him on his pasture land. If you look at a mole-hill, you will find that it is made of fine rich earth. Some farmers rake this over their fields, and the grass grows wonderfully better for it.

The Mole's Tunnels

A MOLE-TUNNEL is the size of the mole's body, and the main tunnels, or high roads, are worn quite smooth by the constant passage to and fro of the moles. From these main tunnels, the mole digs out side lines, exploring here and there below the surface to find food. Probably he is helped in his search by hearing the movements in the earth of the grubs and worms he is hunting. He is a ferocious, strong little beast for his size, and if I were smaller than a mole I certainly should not like to meet him.

The male mole digs himself a nest. This used to be called by the grand name of fortress, and perhaps you have heard it called so. Well, a fortress is something to be held, protected, or fought for, and the mole's nest does not deserve such a name. He simply excavates a hole below the ground, and, to get rid of the earth from it, makes short tunnels to the surface. Up these tunnels he pushes the un-needed earth. This gradually forms a dome-shaped mound. One or two, or sometimes more, passages lead to and from the nest, straight into the main runs, and one leads downwards and then upwards to the surface. In this nest, the mole rests when he wishes to. You may usually find the big dome-shaped mound of earth beneath a bramble bush or in a ditch. Sometimes, however, it is well out in the open.

The mother mole makes a somewhat similar nest, but smaller and simpler, and carries grass and leaves

in her mouth to line it. Her young ones are the queerest little creatures, pink and wrinkled, with no fur at all. They are quite blind too, and do not open their eyes for three weeks. They have a long baby-hood, for the mole's life is a hard one. The little ones need to be well grown and strong before they can venture out on their mining expeditions.

Enemies

THE mole is not hunted by any animals, but is killed and eaten by foxes, badgers, and weasels, whenever they come across him. Owls, too, make a meal of him if they can. Perhaps his chief enemy is man. Mole-catchers trap hundreds of moles in a year by placing the snare in one of the main runs. Sooner or later Master Mole comes along and is caught.

Coats are made of moleskin, and very soft and sleek they look. Mole-catchers usually wear a moleskin waistcoat, and will tell you just how many moles went to make it. I knew one once, when I was little, who had eleven waistcoats all of moleskin—and he promised to give me the twelfth. But, I am sorry to say, he never did!

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *What does the mole use when he tunnels so quickly?*
(2) *What does the mole eat?*
(3) *Why is it that he makes mole-hills?*
(4) *What is his nest like?*
(5) *Draw something that the mole eats.*
(6) *Look out for mole-hills when you go walking.*

THE CUCKOO

" O blithe new comer ! I have heard,
I hear thee and rejoice.
O Cuckoo ! Shall I call thee bird
Or but a wandering voice ? "

HAS anyone heard the cuckoo yet this year ? Every morning in April I listen for him, and hope I shall hear him. It isn't the bird himself I am fond of, but his quaint call that tells me spring is really here. The cuckoo is not a bird I admire, though his life history is among the most interesting of any of our birds—as perhaps you will agree with me when I tell you a little more about him.

A Lazy Mother

To begin with, the cuckoo builds no nest. At the time of the year when most birds are giving the finishing touches to their own cosy little nests, the cuckoo is flying about having a gay time in the woods. Then one day the female cuckoo lays an egg. She has no nest in which to lay it, so she lays it in the grass. Now, what shall she do with it ? It is no use leaving it there—it will be found and eaten by weasels or stoats—so it must be safely stowed away somewhere.

The cuckoo picks it up in her wide bill and flies off

with it. She looks for a nice nest belonging to some other bird, maybe a meadow-pipit, a wagtail, redbreast, or hedge-sparrow. She chooses a nest with eggs in, for then she knows her egg will be warmed and hatched by the bird who owns the nest.

The Cuckoo's Egg

Now, the curious thing is that the cuckoo lays eggs which resemble in colour the eggs of other birds. Her egg may be blue like the hedge-sparrow's, or reddish brown like the pipit's egg or the robin's. This, you will say at once, is so that the other bird may notice no difference when she visits her nest again. This *is* the reason, of course, but yet the curious thing is that often the cuckoo does *not* put her egg into a nest where there are similarly coloured eggs. I have found a bluish cuckoo's egg with the brown eggs of a meadow-pipit. It would certainly have done better in a hedge-sparrow's nest. But as the cuckoo is a lazy bird, probably she couldn't be bothered to match her egg properly—she just popped it into the first nest she found.

Some naturalists say that the cuckoo lays her egg straight into another bird's nest, and not on the ground. Keep your eyes open and see if you can some day find out the truth. There is still so much to be found out about Nature, and naturalists want all the help they can get, especially from keen-eyed children.

When the Egg Hatches

For such a big bird, the cuckoo lays a very small egg, but you can guess the reason for that—she has to put it with the little eggs of birds smaller than herself.

THE YOUNG CUCKOO FED BY ITS FOSTER-PARENT

Another curious thing about the cuckoo's egg is that it hatches in a shorter time than those of most birds, and you will soon see why, when I tell you what the tiny fledgling does directly it hatches.

It usually hatches out before the other eggs, so that it has only eggs to deal with. Even if the other eggs should hatch out first, the baby cuckoo can overcome the little birds fairly easily. Directly the tiny cuckoo hatches, it is filled with one idea—and that is to be alone in the nest. It can't bear to be in there with anything else—eggs or young birds. If anyone puts a stone in the nest the baby cuckoo will even turn *that* out!

Have you ever seen a baby cuckoo? It is an ugly little thing, with a smooth black skin and no vestige of feathers. However does this queer one-day-old baby manage to throw eggs and other baby birds out of the nest?

The story is a wonderful one. If we could peep into the nest where the baby cuckoo had hatched, we should be astonished at his doings. He is a regular little murderer.

The Baby Cuckoo at Work

He lies at the bottom of the nest, an ugly, blind, little black creature. Then suddenly he seems to get into a terrible rage just because he feels another egg near to him. His legs stiffen, and he pushes and twists, until the offending egg rolls on to his back.

"But how does it stay there?" you ask. "Doesn't it roll off again?" No, it doesn't, because the baby cuckoo has an artful little hollow between his shoulders, and into this the egg just fits, and stays there.

"Now to get rid of it," thinks the baby. But he

must climb right up the side of the nest before he can tip out the egg, and the nest-wall seems like the side of a house to him. But look at his feet—he has a climbing bird's feet—two toes in the front, two at the back—so that he can quite well climb up the nest to the top.

And yet the cuckoo in after life is *not* a climbing bird ! It only needs this kind of feet when it is small, so it is born with them. It is really rather extraordinary.

The baby cuckoo climbs slowly backwards up the side of the nest, feeling about with his tiny wings to find out if he is near the top. At last he reaches the edge, jerks himself, and off goes the egg over the top of the nest. Smash ! It falls on the ground below. The cuckoo feels about with his wings to see that the egg really *is* gone, and then tumbles down exhausted to the bottom of the nest.

Everybody Overboard

But directly he recovers his strength, he has another fit of rage because a second egg is beside him, and he goes through the same performance with that one too. If young birds are in the nest, his task is more difficult ; but somehow or other he succeeds in getting each poor little fledgling on to his back, and then hoists them over the edge on to the ground below. In vain they try to clutch hold of him and save themselves. His body is so smooth that there is nothing for them to catch hold of !

Only when he is alone and king of the nest is he satisfied. Sometimes it happens that two cuckoos each put an egg into the same nest, and then there is a fine old tussle between the two babies when they

hatch out! Sometimes they give up the fight and live together in the same nest.

The Foster-parents

But what do the hedge-sparrows, the robins, or the pipits think of the baby's wickedness? This extraordinary child, hatched out of one of their cluster of eggs, must surely fill them with anger and distress! Surely the little foster-parents object to him?

Not a bit of it! They don't seem to notice the strange egg when it is put there—and then when it hatches out, and the baby begins to turn out all the other eggs or young birds, the foster-parents make no objection at all, though they must see the performance, or part of it, themselves—for it takes a fair amount of time to get through.

No, they leave the young birds dying outside the nest, and get on with the work of feeding this other amazing bird-child.

A Greedy Little Bird

He keeps them very busy. He has an enormous appetite, and calls for food all day long. He has a very appealing, wheezy cry, and the foster-parents can't make him stop it. Even if danger is near, and the baby is warned of it, he still goes on calling, calling, calling. Sometimes other birds feel so sorry for him that they help in feeding him, too, and then the cuckoo is spoilt indeed!

He grows very fast, and soon looks ridiculously big for the nest. He becomes much bigger than his foster-parents, and then they find that the easiest way to feed him is to perch on his big shoulder and feed him from there! I have seen a hedge-sparrow

do this, and very ridiculous he looked. I couldn't help feeling that the great big cuckoo wanted a good spanking!

The cuckoo's food is mostly made up of caterpillars and grubs. He loves the furry "woolly-bear" caterpillars, and is almost the only bird who really enjoys them. The mother-cuckoo always chooses the nest of a bird whose food is insects, not grain or seeds —for a seed-eating bird would not feed the cuckoo rightly, and it would die.

The Cuckoo's Good-bye

CATERPILLARS are not to be found in winter, so the cuckoo leaves us in late summer for lands where he can find all the food he wants. The old birds go first, and the young birds later. How do they find the way without the old birds to lead or guide them? That is one of the mysteries not yet properly solved.

The cuckoo usually arrives in April. You know the old rhyme, of course, that begins:

"*In April,*
Come I will."

The male cuckoo does most of the calling, and is easy to imitate. You must try it. Cover your mouth with your hands and you will get the queer muffled tone. Hide in a hedge or a bush and call "*Oo*koo, *oo*koo" down in your throat, and if you do it properly you will have half a dozen cuckoos answering, and getting quite worried because they can't find the cuckoo that keeps calling!

Cuckoos have another call—a bubbling noise—which you may have heard when walking through the

woods. And later on their double call has a third syllable added, making it " Cook-oo-koo."

The Cuckoo's Plumage

In colour the cuckoo is slate-grey above, and has white bars and tips to his outer tail-feathers. His breast is white with dark bars. His bill is black, his mouth is orange, and his legs and eyes are yellow. Young cuckoos have their upper parts barred with brown.

The cuckoo is rather like the fierce sparrow-hawk to look at, and is sometimes followed by a mob of small birds, who call at him and chatter angrily, as if they were saying : " You big bully ! Get away, you horrid sparrow-hawk ! "

But his habits are certainly not those of a hawk, for he lives, as we have seen, not on young birds, but on harmful grubs. For this reason he is a useful bird, and for all his bad ways we cannot help welcoming him every spring when we hear his pretty double note coming on the breeze—" cuckoo ! cuckoo ! cuckoo ! "

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *Where does the cuckoo put her egg ?*

(2) *What does the baby cuckoo do when it hatches ?*

(3) *Do the cuckoos stay with us for the winter ? If not, where do they go, and when do they come back ?*

(4) *Describe a cuckoo's plumage.*

(5) *Draw a nest with four eggs in, one of which is a cuckoo's.*

(6) *Keep a note of the date each year on which you first hear the cuckoo calling.*

THE BUTTERCUP

" Every morning in the fields,
A host of pixies tiny
Polish all the buttercups
To make them bright and shiny."

VERY soon will come the loveliest time of the year—buttercup time. The fields will be spread with gold, and thousands of children will go and gather armfuls of the lovely yellow flowers to decorate their houses. A bowl of buttercups in a dark corner is like a splash of sunshine on a grey day. I should like to make a law to say that every home must have one vase of buttercups in it every summer—for then people would have to go out into the fields and meadows. They would come back thinking that the world was a very beautiful place.

In April the buttercups begin to open out their shiny little cups. In May there are thousands of them to be seen, and in June, just before the haymaking robs the field of its gold, there are so many buttercups swaying and swinging that they seem like one long golden carpet. And when we walk through the fields our shoes and stockings are painted gold, for each buttercup we brush against sends out a shower of fine, clinging pollen.

Did you know that there were different kinds of buttercups, or did you think they were all just the

same ? If you go for a walk in May or June and pick the buttercups from bank, field, and wayside, you will probably find, when you bring them to school and sort them out, that you have three different kinds. I wonder if you could pick out the three sorts without being told what differences to look for.

The Bulbous Buttercup

THE bulbous buttercup is the first one to come out. You will probably find it flowering in April, if the weather is warm. It has a lovely golden cup, with masses of yellow stamens circling a knot of green seed-boxes in the middle. Now look beneath the yellow cup. You will see the pale green sepals there, all neatly folded back, close round the stalk. Have a good look at these, for you will not see them exactly like this in the other two buttercups I shall tell you about.

Now look at the stalk. It is a little hairy, to keep back tiny insects which might rob the buttercup of honey, and bring no pollen in exchange. There is something else you will notice about the stalk too. It has a narrow groove or channel on one side.

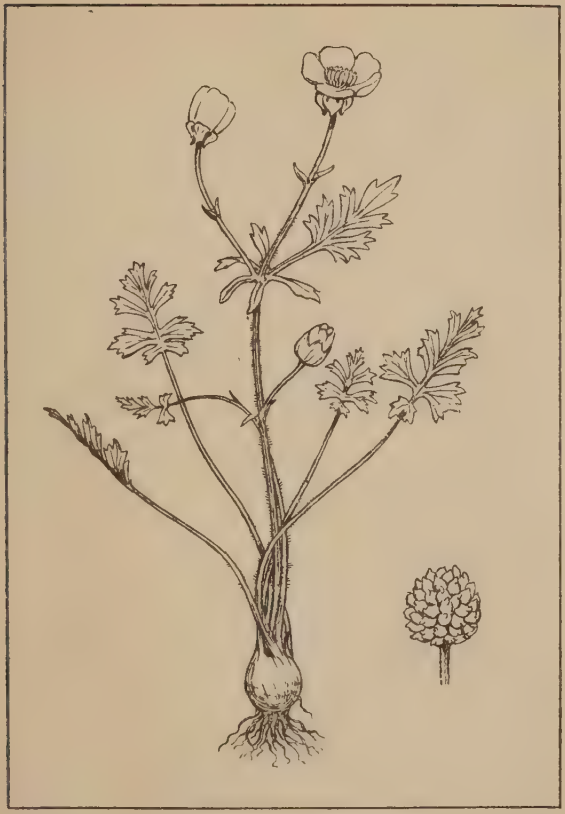
The leaves are dark green and very much cut up. Look at the soft hairs all over them.

If we had the root of this buttercup, we should see why it is called the *bulbous* buttercup. It is because its root is like a little bulb, turnip-shaped, with a great many threads growing out of it.

The Meadow Buttercup

Now, what about the tall meadow buttercup ? How is it different from the bulbous buttercup ?

Well, to begin with, you will see that the glossy



THE BULBOUS BUTTERCUP

Flowers, Leaves, Bulb, and Fruit or Head of Achenes (Right).

petals are not so cup-shaped as in the first buttercup you looked at—but there is the same ring of yellow stamens, and the same knot of green seed-boxes. Turn the flower upside down, and look at the green sepals behind. You will at once see a difference between the two buttercups, for this flower does not bother to fold its sepals neatly back round the stalk. They are spread out behind the golden petals.

Now what of the stalk, is that the same? No, it isn't. It has no groove or channel down one side, and is more slender. It is hairy, though, as was the other stalk.

The leaves are dark green, and cut up very deeply. If we had the root we should see that it is made up of very long fibres and has no bulb.

That is two buttercups we have examined. Can you remember the chief differences? One has turned-back sepals, a grooved stalk, and a bulb. The other has spreading sepals, ungrooved stalk, and *no* bulb.

Now for the third. As you might expect, it is a mixture of the two.

The Creeping Buttercup

THE creeping buttercup is given its name because it sends out root-runners, which creep along and take root wherever a leaf shoots up on the runner. You can quite well imagine that a plant which does this multiplies very rapidly, and is very difficult to get rid of once it has taken up its quarters anywhere.

You know what to look for now. Are the sepals turned back or spreading? "Oho!" you say, "they are spreading! That's going to muddle me up with the meadow buttercup."

No, it isn't. Look at its stalk. It is grooved down

one side, and we have just seen that the meadow buttercup is ungrooved. So now you can easily tell which is which, even if you have no root at all to guide you. Here is a little table for you to remember.

Bulbous Buttercup.—Turned-down sepals. Grooved stalk. Bulbous root.

Meadow Buttercup.—Spreading sepals. Ungrooved stalk. No bulb.

Creeping Buttercup.—Spreading sepals. Grooved stalk. Runners.

Buttercups in General

Now for a little talk about buttercups in general. Have you noticed their glossy petals? They look as if they have been freshly polished by small fairies with pots of polish and dusters. They have a perfectly lovely sheen, and it is no wonder that it is reflected under your chin when somebody says "Do you like butter?" and holds up a buttercup to find out!

There are five petals and five sepals. Each petal has its little gland of honey, hidden beneath a scale at the base. The stamens are full of yellow pollen, and they ripen on the outside of the ring first and then towards the inside, before the stigmas on the seed-boxes are ripe. The outer stamens, when ripe, curl over and hide the nectaries (honey-glands), shedding their pollen on to the shiny petals, not on to the unripe stigmas. This is a clever idea, because when an insect comes for the honey, it has first to push away the stamens hiding it. In doing this, it gets covered with pollen, and when it flies off to another buttercup whose stigmas are perhaps ripe, it is sure to leave some of the first buttercup's pollen on them in alighting. That is just what the stigmas want in order to make the seeds develop in the seed-boxes.

When stamens and stigmas of the same flower are ripe at the same time, self-pollination may take place—that is, some of the buttercup's own pollen may be smeared on to its own stigmas, and seeds may result. Cross-pollination by insects, however, is much better, and better seeds result.

A Simple Experiment

HERE is a simple experiment you can try for yourself. Find a buttercup plant with a good many buds on the point of opening. Cover a few of them with muslin, so that insects can't get in to the flowers when open. Then watch in patience to see what will happen when seed-time comes. You will find that the flowers *un*covered by muslin form fine heads of seeds, while those dependent on their own pollen form few or no seeds. That will show you how important it is to a buttercup to have pollen brought to it from another flower.

The Seeds

Do you know what the seeds of a buttercup are like? You will see plenty of them later on if you look. They are rather like a small green raspberry, and are called achenes. If you pull them off one by one you will count about thirty. Each achene has one seed inside it. If you plant these seeds in a pot when ripe, and put them in a sunny schoolroom window, you will see a score of baby buttercup plants pushing their way up through the dark earth.

The Buttercup's Name

Cows which feed in fields where buttercups grow are supposed to give milk which makes excellent butter. Not because they eat the buttercups, though, for they

don't—but because buttercups grow best on good, sound pasture, where the grass is rich and nourishing. The cows feed on this rich grass, and so give good milk. Now perhaps you can see the reason for the buttercup's name, though I always think it is rather a roundabout one : Cows feed in buttercup fields where the grass is good, and give milk which makes fine butter—therefore, feed your cows in buttercup fields. Yes, certainly a very roundabout reason. I like best to think that it is just a very apt name for a flower whose cup is the colour of rich golden butter.

Cousins of the Buttercup

Do you know any of the buttercup's cousins ? It belongs to a big family called Ranunculaceæ. Perhaps you can think of other members of the family—the lesser celandine with its glossy petals, the baby aconite with its collar of green, and the bold marsh-marigold. Water-crowfoot, wind-flowers, traveller's joy, meadow-rue, goldilocks, columbine, and larkspur are other cousins of the buttercup, so you will see it is very well off for relatives.

But, of all the family, I really think I like the buttercup best, because I love the sunshine, and the little yellow flower always looks to me as if it were made from the pure golden sunshine itself.

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *How many kinds of buttercups have we? What are their names?*
(2) *How can you tell which are which?*
(3) *What are buttercup seeds like?*
(4) *Draw a buttercup from a plant in front of you.*
(5) *Find the seed-boxes later on, and plant the seeds in a little pot at school.*

THE MAY TREE

" Who's been married beneath the may
And strewn confetti adown the way ?
Who's been dancing on elfin toe,
And caught the petals as down they go,
Oh, Peronel and his sweet Sylfai
Have just been married beneath the may ! "

OF all the trees in the countryside there is none so gay nor so fairylike as the may tree. I don't wonder that elfin folk choose it for their marriage-tree—it is so white and beautiful, and its fragile petals drifting to the ground make the daintiest confetti that even fairy folk could wish for.

In its own month, the month of May, the may tree, or hawthorn, is at its very loveliest. Then its cascades of white blossoms deck the tree from crown to lowest boughs, and the lovely masses of flowers lie like drifted snow along every hedge of hawthorn. To walk down a lane when the hedges on each side are fragrant with white may, when the cuckoo is calling in the distance, and when the breeze suddenly ruffles a hundred wee petals from the hedge and sends them fluttering to the ground, is like a beautiful dream. A carpet is spread of white petals and green grass, and every

HAWTHORN BLOSSOMS AND HAWS

minute the white pattern becomes whiter as more petals float softly down.

Bread and Cheese

But it is not only in the summer time that the may tree is beautiful. In the early spring it is one of the first trees and bushes that we eagerly search for the bright wee bits of "bread and cheese"—the first new leaves, unfolding miraculously from the hard, red-brown stems. In a sheltered lane we find them very early, standing bravely out against the dark hedge, like sturdy green banners of spring-time. When the whole hedge has its greenery, it looks for all the world as if it were standing in a fine mist of green, so tender and bright are the first new leaves.

Hidden here, there, and everywhere are the beautiful little may-buds, which are only waiting for sun and shower in order to grow and to blossom. They grow in small sturdy bunches, each bud carefully folded up in its green mackintosh of sepals.

Then comes the wonderful day when all the hawthorns seem to say, "Go!" And, hey presto! the lanes are embroidered with snowy white, and every meadow is trimmed with may-blossom.

In the Autumn

You might think that, having made itself beautiful in the spring-time and the summer, the may would take a rest in the autumn. But, as I dare say you've noticed, it does nothing of the sort. It changes its green dress for another one of lovely reds, browns, and gold, and stands proud and beautiful until the rough winds strip off its fine frock, and throw it in tatters to the ground.

"But still I'm beautiful!" says the may. And so

it is. For the wind has left untouched its masses of bright red berries, and they light up the dark branches like a host of little lamps.

The Flower

HAVE you ever looked closely at one of the may-blossoms? We are so used to seeing them all together in masses that perhaps we have never bothered to look at a single flower. But the blossoms themselves are beautiful little things, each standing on its own thin stem. Look at one and see.

There are five rounded petals of white. In the centre of these you will be able to count very many stamens, each with its anthers coloured bright pink, making a most attractive centre to the flower. Right in the middle is the stigma leading down to the seed-box. Honey is hidden near by, and attracts hosts of flies and other insects. Look behind the flower, and you will see the green sepals which once sheltered the bud, spreading out like a green star.

The Haw

BELOW the sepals you will see that the stalk is rather swollen. Do you know why? It is because that swelling contains the developing fruit of the flower, and when the petals fade and fall it will become a tiny, hard, green berry, called a haw. Later on, when the seeds are ripe, the haws will turn red, so that the birds will see them, and come along to help the may tree in its work of finding new homes for its babies.

The birds peck at the red, fleshy part of the haws, and scatter the curious little stone-like fruits inside. Have you ever seen these? If you haven't you must pick a haw in the autumn, scrape away the red part, and then have a look at the fruit inside. It is so hard

that you will think it is a " stone " such as you have in a cherry, but its real name is achene, and except that its walls are harder, it is the same kind of fruit that you will find in the wild rose hip. The rose, however, has many achenes in its hip, whilst the hawthorn has rarely more than one. If you cut it open you will find the tiny seed inside. Plant a haw in a pot, and watch what happens. You will think that you have a very peculiar-looking little may tree when you see the first leaves that come up ! " Not a *bit* like may-leaves," you will say.

Leaves

THE leaves are prettiest in spring and autumn. In spring they are a bright fresh green, and in autumn they become tinted with lovely colours. In summer the leaf loses its paleness and becomes glossy and dark. Each leaf is cut up into blunt fingers.

The birds love the hawthorn hedges. They are so thick and so sheltered, and are thorny enough to keep out prying animals and humans. Here the feathered folk build their nests, hung round by green curtains, and here the bird babies get their first idea of the world as a place of green coolness, speckled with exciting bits of warm sunshine.

The Thorns

CAN you tell whether the long spines of the may tree are made of modified hairs, like the dog-roses' prickles, or are branches changed into defensive thorns ?

Break off a thorn and look at the place where you broke it off. You will have torn something more than the skin—you will have laid bare the wood of the stem, and made a nasty wound. This shows us that the sharp, strong thorns of the hawthorn are really

branches, just as many of the gorse spines are also branches.

The Tree

It is said that the may tree will live to be 250 years old. "What an enormous tree it must grow to!" perhaps you exclaim. It doesn't. It rarely grows tremendously big, however old it gets. The trunk always remains fairly small. The tree is very bushy in appearance, and has a grey trunk, very rough, and furrowed into scales on the oldest parts. Sometimes the trunk is queerly twisted, rather like a thick rope.

The wood is very, very hard, and takes a high polish, but it isn't really very useful, as the trunk is too small. Hammer handles and walking-sticks are two of its commonest uses.

May Day

May Day is not such a universal custom nowadays as it used to be, though many country schools still keep it up and have the maypole gaily wreathed with may-blossom. The boys and girls dance round it and choose their May Queen, just as the folk of the countryside used to do in olden days.

It was a great day once—this day for welcoming in the warm, bright summer. Everyone had a holiday, and went a-hunting for the snow-white may. Those who first brought a flowering branch home on May Day were rewarded with a basin of cream. Games and dances went on all day long, in honour of summer's welcome return. It must have been lovely to watch.

An Old Legend

There is an old story of Joseph of Arimathea which perhaps you may not have heard. He was travelling

from place to place, and to help him on his way he plucked a sturdy hawthorn shoot and made it into a staff for himself.

One day he landed on the island of Avalon, just at Christmas-time. He was tired out and sleepy, so he found a resting-place and prepared to rest for the night. By him he put his hawthorn staff, firmly stuck into the ground.

Then he slept. In the morning he awoke, and looked for his staff. To his amazement it was no longer a sturdy staff—for in the night it had put out roots, leaves, and blossoms, and was a wonderful sight to see in the early morning sun. Joseph took this miracle to be a sign that he should stay on the island of Avalon. He did, and built there a monastery for himself and his followers.

Last of All

LAST of all, I'd like to say *don't* be content with looking at the little bit of may you have in your schoolroom for your Nature lesson. Go out and see what you think of the gleaming mass of blossoms flung over the hedgerows. Take a good look at it, smell it right down into your lungs, listen to the droning bees round it—and then you will know why poets of all ages have written of the may tree with delight.

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *What is the may tree like in* (1) *spring*, (2) *summer*, (3) *autumn, and* (4) *winter?*

(2) *What is the fruit like?*

(3) *Draw some of the haws.*

(4) *Plant some in a pot at school and see what happens.*

THE COMMON GNAT

" The quick-wing'd gnat doth make a boat
Of his old house wherewith to float
To a new life."

WHAT do you know about gnats, I wonder? "*All* about them," perhaps you answer. "They're nasty little biting things that fly about in the summer. We know quite enough about them!"

Well, I can tell you things about that "nasty little biting thing" that will rather surprise you. Although it is so small and so common, it has a wonderful life history, all packed into a few weeks, ending in the little creature that comes whizzing through the summer evening to settle on our hands or face.

A Water-Baby

THE gnat is a water-baby in its first stages of life. It begins as a tiny egg, floating on the surface of the water with hundreds of other eggs. When next you get a chance go and look at the surface of any quiet pond you know, or any rain-water butt or tank. You will probably be able to see tiny little masses of floating eggs, all glued safely together into a sort of raft. Perhaps they are fastened to a stick or a leaf, perhaps they are free.

You will not find them on running water. Can you guess why? Mrs. Gnat knows that that would be dangerous. Her eggs might be washed away and destroyed. On stagnant water they are safer, for they stay where she lays them.

The Eggs

The eggs are torpedo-shaped, and are pointed at the top end. They lie vertically in the water, and bob about there for a few days. At the bottom end of each there is a little trap-door. If you were a stickleback, and happened to be looking at these trap-doors, you would get a great surprise when you saw what came out of them. Not a gnat, not anything *like* a gnat—for when the trap-door flies open out comes the queerest creature, about half an inch in length.

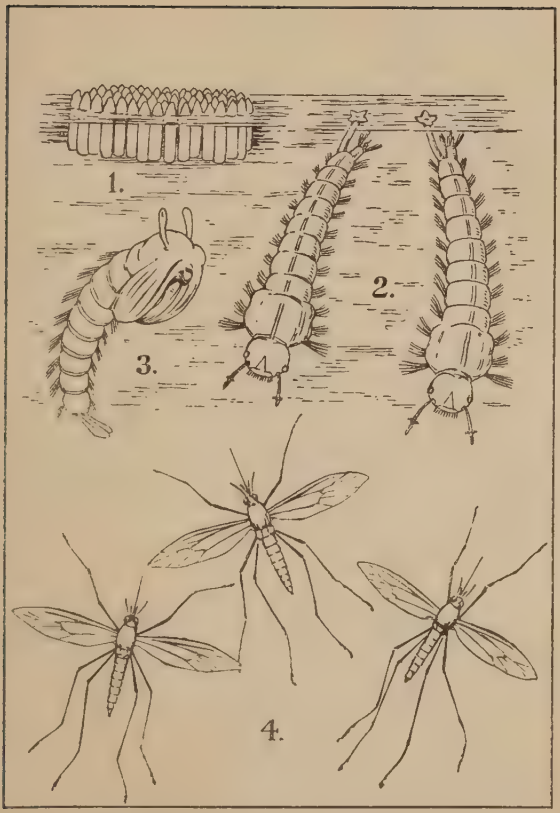
The Larva

It is a long, jointed, large-headed creature, legless and dark. It is very active, and darts about the pond as quickly as a tadpole.

Round its head are bristles. By waving these vigorously about, it wafts food into its mouth. Its meals are made up of the tiny little creatures in the water, and, judging by the way the gnat larva grows, it makes very good meals.

Curiously enough, it doesn't breathe the air in the pond. It breathes our air instead. "But how does it do that?" you will say.

It has a queer little tube fitted on its tail-end. This is an air-tube, and by sticking this out of the water it can take in what air it needs. The larva is so light that it can hang itself upside down on the slight film always to be found on the surface of stag-



THE LIFE STORY OF THE COMMON GNAT

1. *Raft of Eggs.* 2. *Larvæ.* 3. *Pupa.* 4. *Female Gnats.*

nant water. Here it hangs head downwards, swaying to and fro as it waves its bristles in search of food, one of the queerest water-babies you can imagine.

The air-tube runs all through its body, branching out here and there into smaller passages, so that the air gets to every part. This tube is prevented from being flooded by an ingenious little cap, which fits over it when the larva darts downwards.

For two or three weeks the gnat larva spends its life in this way. During that time it changes its skin three or four times. You can often discover these thrown-off skins floating in the water if you look—like little pale ghosts of the active larvæ you can see swimming here and there.

Sometimes on a quiet, sunny day, you will see scores of the larvæ hanging themselves up on the surface film, enjoying the warmth. Pass your hand over the water and make a shadow. Immediately every larva darts away from the surface in alarm, and you will see a hundred little wrigglers dashing downwards in fright.

The Pupa

JUST as a caterpillar passes into a pupa or chrysalis, so does the active little gnat larva pass into a third stage, when it, too, becomes a pupa.

These transformations are wonderful things. No matter how keenly you watch or how closely you observe, you can't probe the mystery of the changes. They just happen.

One day the larva is an active, eating little creature, the next it is changed into a being that does not need to eat, and is quite different in form. The head becomes very large and helmet-shaped. Fins appear

at the tail-end. The air-tube disappears, and two others grow from the head-end. It now hangs tail downwards, instead of tail upwards. Why?

"That is easy to answer," you say, "it hangs tail downwards because it now breathes through air-tubes on its *head*."

This curious comma-shaped creature, with no appetite, is quite active. It moves about freely, and has no fear of its air-tubes being flooded when it descends into the deeps of the pond, for they are fitted with a delicate fringe of hairs to protect them against such a danger.

A Little Boat

THE gnat's life has been wonderful enough so far, but the greatest wonder is still to come. Within this comma-like being, a marvellous piece of magic is going on, as marvellous as that which turns a caterpillar pupa into a butterfly.

Underneath the skin of the pupa, a creature is forming, a creature with legs, feelers, and wings—utterly unlike the larva or pupa. The gnat is approaching the day when it will become a perfect insect, and fly above the water in the breezes and the sunshine. It will leave its old water-life behind it, and rejoice in an entirely different one, because it will be perfectly fitted for life in the air.

The Great Day

AT last the great day comes—the day when the pupa gives place to a winged creature. I have watched this happen, and a wonderful thing it is. You must try and watch it too. Go to any rain-water butt or tank on a sunny summer day, and watch the surface

of the water closely. You will be sure to see the miracle happening.

This is what happens. The pupa rises to the top of the water, and lets the sun dry its skin. This suddenly cracks along the inner surface, so that a little boat is formed. Out of this boat comes the gnat, all complete with wings and legs.

It looks a queer little creature at first, with its wings all folded and crumpled, and its legs feeble and uncertain. It does not always find it easy to free itself from its skin-covering. Bits of its body or legs get stuck and have to be pulled and twisted before the gnat is finally free.

Then it rests on the frail little skin-boat, drying its new skin and expanding its new wings, until it feels strong enough to fly.

But very often a tragedy happens. A breeze comes by, and sends little ripples over the pond. The tiniest ripple capsizes the little boat, and over goes the clinging gnat and is drowned in the water which has been its home for weeks. A leaf or twig bumping into the boat will send it over too, and many thousands of gnats perish every year in this way, before they have taken their first flight into the sunshine.

The Perfect Insect

I AM sure you know what the gnat is like—a yellow-brown creature, with a slender body, gauzy wings, and extremely long legs. The wings are laid flat on its back when not being used. The antennæ are many-jointed, and in the male gnat look very feathery, for they have hairs growing down their length.

The male gnat is a harmless fellow. He does not bite, for he cannot. He simply dances in the sun-

shine with his friends, and goes to taste the honey in any nearby flower.

Mrs. Gnat

It is Mrs. Gnat who does all the harm. It is she, too, who makes that high, whining noise—Mr. Gnat cannot make it. His wife makes it in two ways—by the swift beating of her wings, and by means of the air in her breathing apparatus.

Mrs. Gnat has a most complicated set of mouth parts. She needs stronger food than honey, so she comes to us. She has to lay the eggs, and wants an enormous meal to help her in her chief business in life. In her trunk she has instruments with which she can pierce right through our skin and suck up the blood. This she will do if we give her a chance.

With her needle of a trunk she pierces through our skin, and skilfully enlarges the opening. Then she sucks up the blood, making it flow freely by injecting a minute drop of a very irritating poison. It is the poison she injects which makes the place so painful and causes it to swell. As you will see, it is not really a "bite," although we call it so. The gnat pricks us, not bites.

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *Where does the gnat lay her eggs, and what comes from them?*
(2) *What does the larva change into?*
(3) *When does the gnat change from a water-baby to an air-creature?*
(4) *Describe what happens.*
(5) *How does Mrs. Gnat raise "bumps" on our arms and legs?*
(6) *Draw a raft of eggs on the water.*
(7) *Go and look into a tank or barrel and find some gnat-larvæ.*

THE FOXGLOVE

" *See where she stands so pensive and tall,*
Hardly awake when the humble-bees call;
What is she dreaming of, all the day through,
Witches or fairies? I don't know! Do you? "

OF all our grave, dreamy flowers, I think the foxglove is the dreamiest. I have never seen a foxglove that looked really awake. They all seem to stand half-asleep and dreaming, as if they didn't know you were there at all. Most flowers are very wide-awake—daisies, poppies, hawthorn, wild rose, pansies, buttercups, all these seem to know you are there and greet you joyously—but foxgloves are always still and half-asleep. They are fascinating flowers.

A Fairy Name

Do you know how the foxglove's name really ought to be written? It should be spelt " Folk's glove," because that was its name in the beginning. When the foxglove was first named, the word " folk " was often used for " fairies." The Little Folk were the fairy folk. So folk's glove meant fairy's glove, and the foxglove was supposed to give a blossom for each fairy to slip over her thumbs. Then when she gathered flowers or plucked berries no thorn would run into her thumb.

THE STATELY FOXGLOVE

(*Top Right*) *Foxglove flower cut in half showing how stamens and pistil lie along the top.* P. *Pistil.* St. *Stamens.* S.B. *Seed-box.* S. *Sepals.* N. *Nectary.* H.G. *Honey guides.*

So you see our foxglove's name goes right back to the time when fairies were believed in by everyone. Maybe it is of those days that the stately flower is dreaming—times of magic and spells, witches and fairies !

Where Foxgloves Grow

PERHAPS some of you have foxgloves growing in your garden, and have watched them year after year growing tall and lovely. Perhaps others have been lucky enough to find where they grow in the woods, making a little purple-pink corner for themselves. They love a place where the sun gets through the branches of the trees and warms them. You can find them often at the edges of the woods and sometimes in great patches in open places, where the soil is sandy. They are always lovely to find, because they are such beautiful, mysterious-looking flowers. Usually they are a crimson colour, but sometimes you can find pure white foxgloves, and these are really exquisite in their grace and beauty.

They grow from two feet to six feet or more in height, and the higher they grow the prouder and more stately they look. Any garden which can grow a patch of foxgloves is sure of a beautiful corner in the summer. They are easy to grow, and spread well.

Poison !

THE leaves are simple in shape, and are large and downy. They are wrinkled, and rather a dull green in colour. You will not find any animal eating them, and even goats, who seem willing to try anything that looks edible, leave foxgloves alone. The reason is

that the leaves are very poisonous and make any animal feel ill or die, once he has browsed on them.

When powdered up and used properly, foxglove leaves make a valuable medicine. The most poisonous part of the plant (all parts of which are poisonous) is the seed. The wild foxglove is much more poisonous than the garden one, so be careful in your dealings with it. It is a silly trick to do as some people do, and chew leaves or stalks of plants without knowing whether or not they are of a poisonous nature.

Stem

THE flowers are carried on a long stalk. If you look at a foxglove plant, you will notice that the oldest, biggest, and brightest coloured flowers are at the bottom, and farther up are smaller flowers ; at the top there are just little green buds.

You will notice, too, if you look at the main plant stem, that the little flower-stems are arranged spirally up the long stem, but each short flower-stem twists into position, so that all the flowers hang down on one side. A little green bract grows at the base of each flower-stem. The young flowers when in bud stand erect, but, just before they open, their stems turn downwards, causing the flowers to droop. The pistil and stamens are thus protected from the rain.

The Flower

EACH flower has its cup of green sepals cleft into five lobes. The flower itself is a most interesting one to look into. The purple-red corolla is large and bell-shaped, and is tightened in at the base where the seed-

box is. Inside, all along the lower part of the flower, you will find a freckling of purple spots, while a little doormat of hairs guards the entrance.

The spots are honey-guides for the humble-bee who visits the foxglove. He alights on the lower lip, and straightway sees the spots leading into the back of the flower. He walks up the tunnel to find the little yellow-green honey ridge around the bottom of the seed-box. When he can get no farther, he reaches out for the honey in the depths of the flower and takes it. Then off he goes again, walking backwards out of the flower. It fits his body nicely, so he knows it is a flower that welcomes him.

The little doormat hairs prevent smaller insects from alighting and stealing the honey which is meant for the big bees. You will guess that the bee does something in return for his present of honey—and that is, he helps the flower to make its seeds.

This is how he does it.

Inside, pressed against the top part of a flower, you will find four stamens, and also the pistil, which leads out of the seed-box. The stems of the stamens bend on purpose to make the stamens lie against the top part of the flower, for the pollen is going to be brushed on to a bee's back.

There are two long stamens and two short stamens. The anthers at the top of the long stamens ripen first. Then the pollen in the short ones, and last of all the pistil itself ripens. When the bee comes, his back brushes against the pollen-laden stamens, and he goes away with his back full of the little grains. Maybe the next flower he goes into has its stigma ready to receive pollen brought to it, and in going into the flower tunnel he brushes against the ripe stigma, and leaves on it a few pollen grains from the last flower he

went to. This is enough to help the seeds to ripen, and the bee's work is well done. Soon the purple flower drops off, and the seed-box grows in size to make room for the developing seeds.

But supposing *no* bee comes to take the pollen away on its back, or to bring other pollen to the stigma when it is ripe and waiting for it? Will no seeds be made then?

Yes, there will—for the flower's own pollen touches the stigma, and so gives it what it needs for the ripening of its seeds. This is why nearly all foxglove flowers make seed.

It is interesting to watch bees at work on a foxglove. They go to the lowest flowers first, and gradually work upward until they come to the ones just opening —then they fly away with pollen on their backs to start on the lowest flowers of another foxglove, those whose stigmas are waiting anxiously for pollen.

You can see flowers in all stages and ages on the long stalk of the foxglove. At the top are the green buds. Next come the longer, pinkier buds, then those just opening. After these come the bigger, drooping flowers, ready for the visits of bees. Lower still are large blossoms with empty stamen-anthers. Below these are all that remain of last week's flowers —green sepal-cups, with the growing seed-box and the long pistil still sticking out of it. You can thus trace the life history of the foxglove flower from a tiny bud to a growing seed-vessel.

The Seed-box

Look at the seed-box. It is a capsule, and is egg-shaped. It will open, when the seeds are ripe, by splitting on each side. When the wind blows, the

seeds are shaken out, and next spring there will be a tiny foxglove plant growing wherever a ripe seed falls. If you pluck off half a dozen of these seed-boxes when they are ripe, and plant the seeds, you will have a fine patch of foxgloves in your garden in a year or two.

The Foxglove's Cousins

CAN you think of any relations of the foxglove? Its family name is a queer one—Scrophulariaceæ—but as most of the family have rather queer-shaped flowers they deserve a queer name.

The snapdragon in our garden is a cousin, and so is the yellow toadflax of the field. Both of these have very curious "mouth" flowers that open and shut when a bee alights or departs.

Figwort, cow-wheat, rattles, and eye-bright are other cousins. The last three are plants that partly live on others—they have swellings on their roots by which they attach themselves to other plants, and so get food from them.

The bright blue speedwell is a pretty cousin, but I think you will agree with me that the foxglove is the queen of the family.

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *Why do no animals eat foxgloves' leaves or flowers?*

(2) *What are the spots inside the entrance for?*

(3) *How does the bee help the foxglove?*

(4) *Draw a foxglove flower from one in front of you, and write underneath it the proper name—folk's-glove.*

(5) *Find some seed-boxes later on and plant the seeds in the school garden.*

THE HEDGEHOG

" Where are you going to, Prickly One ? "
" A-hunting beetles till rise of sun."
" What will you do when you've found them all ? "
" Eat them, and curl myself up in a ball."
" And when it's cold weather, then *what will you do ? "*
" Sleep sound in a ditch the whole winter through ! "

I AM sure you have seen a hedgehog. Even if you haven't, I'm quite certain you know what it is like, for it is a most unusual-looking animal. It is known by three other names—the urchin, and the hedge-pig, and in Devon and Cornwall I have heard it called by the curious name of furze-a-boar.

The hedgehog is not a cuddlesome animal, for its spines are very sharp and can easily draw blood. They are really hairs which have developed into long, stiff " prickles " for protection. You can well imagine what excellent armour they are. No dog will attack a hedgehog twice—it is like biting a mouthful of sharp needles. The spines, too, make it easy for the hedgehog to attack its prey without fear, for kicks, pecks, and scratches are of no avail against such an array of prickles.

Where the Hedgehog Lives

As its name will tell you, the hedgehog lives a great deal among the hedges. It especially likes the sort of hedge that has a ditch at the bottom, where dead

leaves and moss can be found. Here it curls itself up in the daytime and falls fast asleep. If you go for a walk some day and are astonished to hear a little snoring sound coming from underneath the hedgerow, just poke about there a bit. You will probably find a curled-up hedgehog, snoring to himself and dreaming happily of fat beetles and large slugs !

The second part of his name, " hog " or " pig," is given him because he has a snout, and that makes his face a little pig-like in appearance. Really, he has a dear little face, very alert and intelligent. It is furred, and the eyes are black and bright.

His Body

THE hedgehog is about 9 inches long, and has a funny little stumpy tail about an inch in length. His wife is nearly as big. The neck is very short indeed—in fact, you can't see any when you look at the hedgehog, for his prickles hide his shape. His legs, too, are very short—so short that his body only just clears the ground when he walks. When the fields are covered with snow, he doesn't clear the ground, and you can see the queer trail he makes as his body brushes against the snow at every step.

All his feet have five-clawed toes, and he has five little pads on each sole. His spines are not very long —only about three-quarters of an inch in length—but they are very hard and sharp.

The Hedgehog's Meals

THE hedgehog likes to come out at night-time and prowl about for his food. He has a very wide bill of fare—slugs and snails, worms, insects, lizards, rats, mice, snakes, and frogs, and he will also enjoy a meal

THE HEDGEHOG

of bird's eggs found on the ground, such as the robin's. When he comes across a partridge's nest, or a pheasant's, he is most delighted. "What a lovely larderful!" he thinks—and sets to work to demolish them all. This makes the keeper very angry, and if he can catch Master Hedgehog he does so.

The hedgehog has a nasty habit of creeping up to a sitting bird or basking snake and beginning to eat it up bit by bit. You see, once he has got a hold he goes on munching, and as the wretched bird or snake can make no impression on the sharp spines of the hedgehog it is helpless. It must be a truly horrible death to die.

However, most hedgehogs content themselves with smaller prey, and do very good work in the insect-and-slug-catching line. They are excellent at ridding a garden of slugs and snails, and even of rats, though these fierce animals sometimes defeat the sturdy hedgehog and make a somewhat uncomfortable meal off him.

If you ever have a plague of cockroaches in your kitchen, don't put up with them. Hand your kitchen over to a helpful hedgehog, and he will do the work for you in a very short time. You can often borrow one from your local naturalist—the man who keeps a fascinating shop of birds and other animals. Hedgehogs are extremely fond of cockroaches as food, and you will be surprised at the thorough way in which they get rid of the cockroaches for you.

Rolling Themselves Up

I ONCE had a hedgehog for a pet, and a most amusing little fellow he was. He could climb up the stairs easily, and used to come down them by rolling over

and over. I don't think he meant to—he used to try and walk down, but always over-balanced and fell. Then he immediately rolled himself up tightly in fright, and bounced down the stairs like a ball.

This peculiar way of rolling themselves up is very useful, because all the parts which are without prickles and might be bitten by an enemy are thus protected. Even the face is armoured, for the hedgehogs can push the spiny skin over it whenever they want to.

When you look at a hedgehog's short legs and clumsy-looking body, you would not think he could get along fast, but he can. He runs at a very good pace—rather like those little clockwork mice you buy, I always think. He can swim quite well, too.

Can a Hedgehog Climb ?

SOME people say hedgehogs can climb trees. I don't know myself whether they can or not, but I do know this—they can climb up ivy-clad walls ; for one night whilst sleeping in my room in a country house, I was awakened by something moving on the wide stone window-sill near my head. I lighted my candle. It was a hedgehog ! He must have climbed up the ivy outside, and come to pay me a visit. So I think if they can climb up walls they can probably climb trees.

An Old Story

I AM sure you must have heard the old story of the hedgehog who climbed an apple-tree, shook the branches to make the ripe apples fall, and then threw himself down from the tree so that his spikes stuck into the apples. Then this clever hedgehog was

supposed to hurry off with his apples in order to have a good feast!

Well, first of all, hedgehogs don't eat fruit. They like insects, and their teeth are made for biting through such things as the hard wing-cases of beetles and the shells of snails. Yet I saw a sight one day that made me half believe that old story for an instant.

I was in an orchard of plum and greengage trees. It had been pouring with rain, and the grass was very wet. Slugs, worms, and snails were everywhere. Suddenly I heard a scuffling noise in the grass, and, looking round, I saw, to my great astonishment, a hedgehog running along with a large greengage stuck on his back. He was scared out of his wits, and made a funny little grunting noise as he went along. I didn't know *what* to think.

Then plonk! A big greengage fell from a nearby tree and almost struck the scared hedgehog, who must have thought he was being bombarded. Then, of course, I knew what had happened. The hedgehog had come out after the slugs and snails, and a falling greengage had neatly hit him on his back, stuck on his spines, and given him the fright of his life.

"I'll never go out again in the day-time!" he grunted.

Probably the old story about the apples arose in much the same way.

The Hedgehog's Babies

BABY hedgehogs are funny wee things. At first they are blind and quite helpless. Their spines are pale and not at all stiff, and their ears are limp and drooping. Soon the spines become stiff and change their colour to dull grey, and later to brown, ringed with dark and

light bands. The spines are not always raised, but lie flat until danger is sensed. Underneath, the hedgehog has a rough, dirty-white fur. The babies cannot grunt, but squeak instead.

In the Winter

When winter comes, the insects that make most of the hedgehog's meals are gone. "All right!" says the hedgehog, "I'll go too!" So he looks out for a nice big hole in the hedge-bank—perhaps an old wasp-nest hole—and makes it comfortable. He finds dead leaves and soft moss, and carries them in his mouth to the hole. He neatly lines it with these, and when it is all finished he gets inside, blocks up the entrance with leaves, and falls fast asleep. Here he sleeps all the winter through. He does not store up food for his few waking moments as the squirrel does, and perhaps you can think why. The squirrel feeds on nuts and seeds, and these keep when stored—but the hedgehog feeds on insects, which cannot be stored, for they would not keep. So he does without. But occasionally, on very warm winter nights, he wakes up, stretches himself, and puts his nose out of his hole for a sniff. If the world smells warm and damp, he goes out for a wander round, and picks up anything that he can find in the way of a meal. Then back he goes again to finish his sleep.

His Enemies

The badger and the fox are the chief enemies of the hedgehog, whose spines do not always protect him against these animals. He has another weapon though, and that is the power to give out such an objectionable odour that enemies, in disgust, leave him alone.

Gipsies like hedgehog meat, and bake it in a crust of clay, so that Master Hedgehog has to beware should he wander near a gipsy encampment.

His Relations

THE hedgehog belongs to a family called Insectivora, which, as you can guess, means "insect-eating." He has only four relations. I am sure you will think of one—the mole. Then there are three you may not know—the common shrew, the water shrew, and the lesser shrew. They all have the same long snouts, and eat the same sort of food. Look out on your walks for these little creatures, for they are interesting animals, and you will like to know them.

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *Why does the hedgehog wear spines?*

(2) *What does he eat? Would he be a good pet for your garden?*

(3) *What does the hedgehog do in the winter?*

(4) *Who are his enemies?*

(5) *Draw a hedgehog, if you can. If not, draw something he eats.*

(6) *Write out the poem at the head of the story.*

(7) *If you find a hedgehog, keep him for one or two days. Give him bread and milk, and watch him eating it hungrily. Then let him go, and see if he will stay in your garden.*

THE BAT

" On the bat's back I do fly
After summer merrily."

IN the summer evenings when dusk is falling, there comes a flitting shadow round and about our heads—a shadow that darts here and there—turns and twists, drops and rises in the deftest, most fascinating way. It is a bat, or, as I once heard it called by an old farmer friend of mine, a little " flitter-mouse."

There it goes round the trees, over the house, and down the garden, flapping its quaint wings and reminding us of a butterfly in its uncertain flight. It is searching for flying insects, and eats them on the wing, as the swallow does. When it wants to drink, it skims down to the pond and drinks as it flies.

A Queer Little Animal

HAVE you ever seen a bat closely ? It is difficult to see exactly what it is like unless you can look at it near you in a good light. Then you will see what a quaint little creature it is.

It isn't a bird. You must get that into your head first, because so many people make the mistake of classing it with birds. A bat has no feathers, and all birds have feathers, no matter what kind they are. Also a bat's wings are formed very differently from those of birds.

If you look at the bat closely, you will see that it looks rather like a little mouse whose front limbs have grown long, and whose fingers have lengthened enormously, while between the fingers, and also between the fingers and body, a thin skin has grown. It is this skin outstretched over the fingers that makes the wings of the bat.

A Flying Mammal

THE bat is the only back-boned creature, with the exception of birds, that can fly properly. It is true that there are flying squirrels and flying fish, but these glide, and do not fly. The bat has found the secret, and has adapted its wonderful little body accordingly.

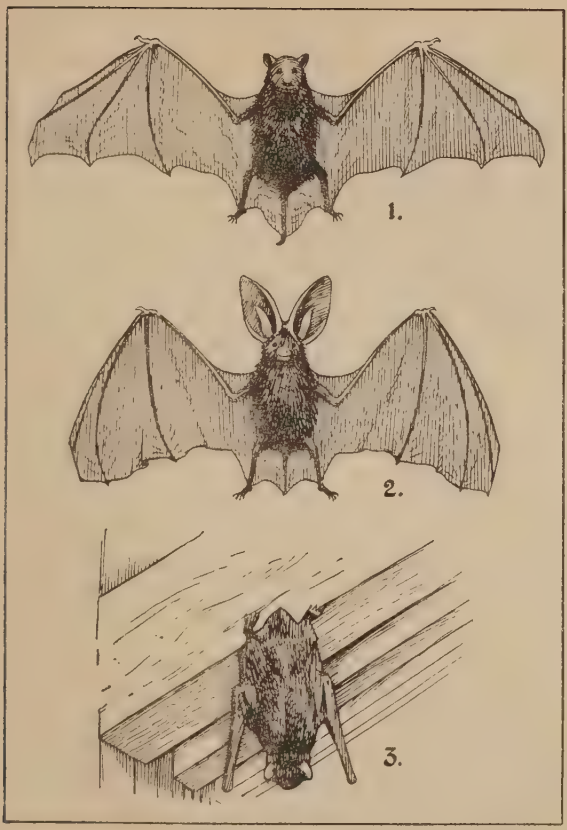
I have often had bats flying into my lighted bedroom through the open window, and then, when they were dazzled by the light, and came to rest on the floor, I could examine them closely. What I saw was very interesting.

The four fingers stretched themselves out like the ribs of an umbrella. The middle finger was very long indeed. Over them stretched a broad web of skin, reaching right to the sides of the body and joining it. The legs, too, were joined in with the skin, and even the tail. When the bat stretched out its arms, lo and behold ! it had two big, strong wings !

The thumb was not joined into the web of skin. It stood up separate, like a little hooked claw. This the bat used when it wanted to climb or to hang itself up.

The Face

WHEN I looked closely at the bat's little face I didn't think it was very pretty. Its ears stood up, short and broad with blunt tips. It had little swellings on its



THE BAT

1. *Common bat, showing lengthened arms and fingers.* 2. *Long-eared bat.* 3. *A sleeping bat, hanging upside down from a rafter.*

muzzle, and its eyes were small, while its mouth was rather wide.

Its silky fur was reddish-brown, and a little lighter underneath. Its wing-membranes were black. It was very clumsy on the ground, for it found great difficulty in walking—and no wonder, for its knees turn backwards instead of forwards !

But, when I put it out of the window once more, it was no longer a clumsy, ugly little animal, but a deft and graceful little creature, performing all sorts of agile antics in the air. It caught a moth here and a beetle there, hardly pausing in its flight as it did so.

Teeth

THE bat's teeth are just the kind it needs for its food. They are many, and are very sharp and pointed. When you think how hard and tough the wing-cases of a beetle or a cockchafer are, you will know why the bat needs such sharp, pointed teeth. He has to crunch right through the tough beetle-shards in order to get at the soft body beneath.

Sight, Hearing, and Smell

ALTHOUGH the bat is not supposed to have a first-class brain, its senses are very highly developed indeed, especially the sense of hearing. In fact, many bats have two sets of ears, and can hear the tiniest fragments of sounds. Curiously enough, while they can hear noises such as the tearing of paper or sharp clicks, they do not seem to hear—or, at any rate, to notice —low sounds, even though they may be very loud.

The bat has very keen sight in the twilight, but, like all creatures whose eyes are fitted for work in

the dusk or dark, it is dazzled by strong daylight or bright artificial light.

Perhaps the best of all the bat's senses is the curious one of being able to sense things at a distance. Blind and deaf bats, for instance, will fly about avoiding with perfect ease anything in their way. In one experiment made by a naturalist they flew about a room, avoiding such slender things as lengths of cotton stretched here and there. How did they do it?

They could neither see, smell, nor hear the obstacles in the way. Probably their whiskers helped them, and their very sensitive wing-membranes, which are covered with nerves; but even then they must have another sense, the sense of being able to feel things before they get there! No wonder they are good at catching insects!

The Bat's Voice

HAVE you ever heard a bat squeak? Perhaps you didn't know it had a voice at all! But it has—a very shrill, high one, so high that many people cannot hear it, any more than they can hear the high squeak of a baby mouse. Listen very hard when bats are about, and see if *you* can hear them squeak.

In the Winter

WHEN winter comes, insects have disappeared. What are the bats to do? They must choose either to migrate or hibernate. They choose to hibernate, and in every disused barn, bell tower, and ruin, you will find scores of bats sleeping the winter away. They hang themselves upside down by their hook-like

thumbs, wrap themselves round with their wings, and fall into a deep sleep.

Through the cold winter they are warm enough to keep alive, although their temperature falls very low indeed. Their close, thick fur and their wrapped-over wings keep them warm. Many bats have an extra layer of fat under their skins just before hibernation, and this, too, helps to keep up their temperature.

Most bats like to sleep together, and can sometimes be found by the hundred, especially in old caves which are seldom entered or disturbed. This habit, also, keeps them warm in their sound sleep during the winter months. They are not too sound asleep, however, to wake when an extra warm day comes. A few insects may have awakened, too, and the bats fly out to have a slender feast.

Baby Bats

YOUNG bats are the queerest little creatures. They are born blind and nearly naked. The mother rarely has more than one, and this clings to her fur at once with its tiny claws. It soon grows, and when it is only a fortnight old it sometimes leaves its mother for a little while. She looks after it until it is quite two months old, and then it flies away to lead its own life.

Wherever bats live, they leave behind them a curious smell, not at all pleasant. You will always know whether bats sleep or hibernate in any hollow tree, ruin, or cave by this odour, which you won't like at all!

Our Common Bats

THE bat you are most likely to see is the Common Bat. It can be seen everywhere on a summer evening, in town, garden, or countryside. It is very

small, for its head and body are only about an inch and a half long, but its wings are strong, and stretch about 8 inches. It catches its insects deftly, and pouches them in the little pocket of skin between its legs. Then it eats them whilst still on the wing.

Another common bat is the Long-eared Bat, which you will easily know if you see it near you, for, as its name tells you, it has very long ears. They are even longer than its body! The bat takes great care of them, and carefully tucks them away in its wings when it hangs itself up to sleep.

Foreign Bats

THERE are two other kinds of bats besides our insect-eating ones. There are the fruit-eating bats found in Africa, India, and other countries; these feast on all kinds of fruit, and do great damage in plantations. Then there are the Vampire or Blood-sucking Bats, tiny little creatures, whose sharp teeth enable them to pierce the skin of cattle and suck their blood. Travellers tell, too, of having their toes bitten by these little vampires, if they have been foolish enough to go to sleep with their feet sticking out of the tent!

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *What are a bat's wings like? How are they made?*

(2) *What does it eat? What are its teeth like?*

(3) *What does it do in the winter-time?*

(4) *Draw a bat's wing, if you can.*

(5) *Watch the bats this summer, and see if you can tell when an insect has been caught.*

FLAT FISH

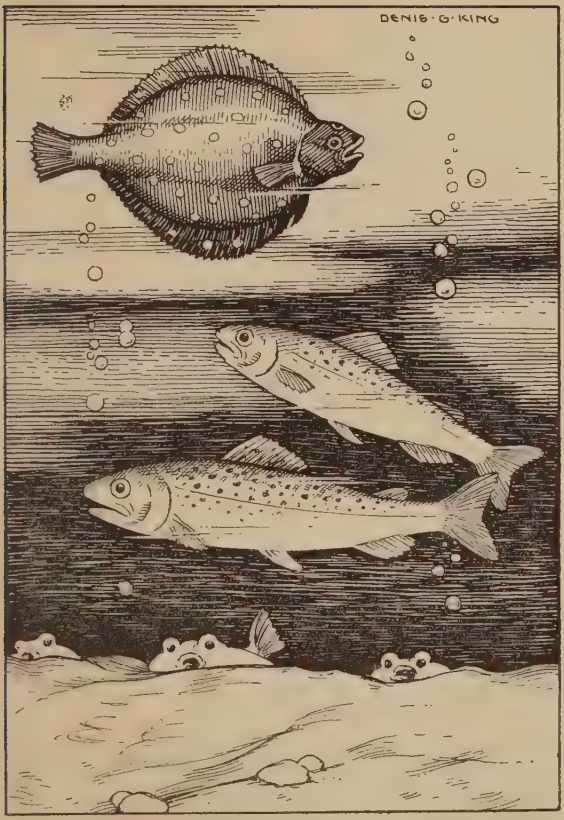
" Cheer up," said a cod to a flounder,
" Why look so mournful as that ? "
" It isn't my fault," said the flounder,
" I do *feel so terribly flat ! "*

HAVE you ever looked at a flat fish and wondered how in the world it happened to become such a queer shape ? Perhaps you have never thought of it at all—but next time you pass a fishmonger's shop just stop and look at the fish there. Look at the ordinary-shaped fish, such as the herrings, and then look at the plaice or turbot. You will soon see how different they are.

They have an interesting and extraordinary story—a story you can watch happening for yourself, if you happen to live near an aquarium in which are kept young flat fish.

Thin Fish

REALLY and truly these fish are *thin* fish, not flat fish ! Their bodies are compressed from side to side so that they are very thin. The " top " of a flat fish is really its right (or sometimes left) side, and the bottom is its left (or right) side. It is not nicely rounded into a boat or torpedo shape, as most fish are, and its eyes are very queer—for they are both on one side of the



PLAICE AND TROUT

(*Below*) *Flat fish buried in sand with only eyes showing.*

head instead of one on *each* side. This gives it a very strange look.

Look at the fins, too. The back fin is a very strong, long one, stretching from its tail to one side of its head. Instead of ending *between* the eyes, or in a line with the centre of the eyes, it ends on the outer side of the left eye. The lower fin, too, is strongly developed. Altogether, it is a very queer fish.

The Baby Flat Fish

YOU wouldn't know a baby flat fish if you saw one, because it *isn't* a flat fish when it is little! It is just like an ordinary fish then, boat-shaped and nicely rounded, swimming along by means of its tail, like all its companions. How has it altered its shape, and why? It is an interesting story.

The baby fish swims about merrily for three or four weeks. It uses both its eyes in the normal way, and there is nothing strange about it.

The Change

THEN it suddenly has a strong feeling that it would be lovely to go and lie down on the sand at the bottom of the sea, or of the aquarium. It swims down, and lies on the sand on its side. It chooses its left side to lie on if it is a left-sided fish, and the right side if it is a right-sided fish.

There it lies quietly, feeling quite at home. After a while it swims off again, but it soon returns to the sand once more and has another little rest. It does this so often that curious changes begin to take place.

Just imagine a herring or a stickleback lying down on its side. You would only see one of its eyes,

wouldn't you? The other would be underneath, hidden in the sand or mud. It would be of no use at all.

"But I *must* have my two eyes," says the flat fish. "What's the use of having one buried away down there?"

Then gradually the miracle happens. First of all one of the bars of gristle (which are above each eye) disappears—the bar over the hidden eye.

Then the eye begins to move from one side of the head to the other! This is really a very extraordinary thing, because parts of the body usually have to remain in the place in which they are found at birth. The soft bones of the fish's skull twist round, and bit by bit the eye travels round.

And one day, hey presto, the left eye is beside the right, and the flat fish can use both. "This is better!" he says, and rolls them all round to see if any food is coming his way. They stick out from his head, so that he has a very good view of the water around him. The funny thing is that he doesn't always move them in the same direction at once, as we do. You will sometimes see a ridiculous flat fish with one eye solemnly looking forward, and the other gravely looking backward.

Further Changes

Not only do his eyes alter, but his body does too. Lying on the sand, on his side, makes his under side (or left side as it really is) very flat. His upper surface becomes coloured, and it needs to, for a silvery or white fish lying on the sand or pebbles would show up very clearly. Hungry enemies would see him, and soon snap him up.

So Nature begins to colour him a little to hide him. She makes his upper surface sandy or mud-coloured, and then he is so like the sand or mud that it is impossible to see him as he lies there. On light mud he is light-coloured, on dark mud dark-coloured, and no matter where he settles down, he can most conveniently change his colouring to match his surroundings. He has, as you will agree, a most adaptable body!

The plaice likes to settle down on sand, and his upper surface is splashed with red-brown spots, exactly like the little speckles or spots found on a stretch of sand. He is very well hidden indeed when he flops down and waits for his dinner.

The under side of the flat fish is not dark, but pale. Usually it is white. There is no need for it to be coloured to match the sand.

Very often flat fish wriggle themselves down into the sand, and leave only their big eyes showing. They look most absurd then, and no one would possibly guess that a big flat fish belonged to those two knobs sticking up. I have often watched them in the Zoo aquarium, and smiled at them. Disappointed visitors look into the tank for the flat fish, and think they must have been taken out. They think the keeper is joking when he solemnly points to the many pairs of eyes sticking out of the sand, and says, "There are the flat fish, Madam!"

Swimming

THEN one, perhaps, suddenly thinks it will go for a swim, and out come the eyes, and a big flat body after them! Through the water the flat fish goes, wriggling its body in a quaint way, swimming on its

side, with the coloured surface uppermost, and the pale surface underneath.

This pale underside is a good protection for the fish as it swims, for it is difficult to see him underneath, since the white colouring becomes mixed with the light from the surface of the water, and the fish merely looks like a light patch of water.

Sometimes flat fish have been found with *both* sides coloured. These are called " double " flat fish.

A Few Flat Fish

Most flat fish like the salt water they live in, but flounders sometimes come up the rivers, and can be found lying in the mud. Turbot, halibut, plaice, and sole are all flat fish, and are caught by the million round our coasts. Flounders can often be found in shallow water. See if you can find some on your summer holiday. Find a place that is rather muddy to paddle in. Paddle along until you feel something wriggling under your feet. Put down your hand and grab it. You will find that it is a little flat fish, a flounder, and you can have a good look at the queer little thing before you put it back into the water. It won't be big enough for eating, of course. I have sometimes caught them in this way, and if you don't mind the funny wriggling under your toes, it is quite easy. They are usually right-sided, but you can sometimes find left-sided ones.

The halibut is our largest flat fish. It grows longer than a man, sometimes nine or ten feet. It is found in the deep sea, and is olive-brown on its upper surface. The plaice you will know by its red spots. The turbot is very broad and rounded in outline, and is speckled with different shades of brown.

There is a quaint little flat fish found on the American shores called the window-pane. As the fish is almost transparent it is a very good name!

Marking Fish

Did you know that fish, like birds, were marked? We ring birds in order to find out where they go to, how long they live, and how fast they travel. We mark fish to find out the same things. So if ever you catch a fish which has a little black disc attached to it, make a note of the number on it, and send a letter to the Fisheries Inspector, telling him the date you found the fish and where. Then he will look up the number in his Fish Book, and see when it was marked and where, and he will know how old the fish is, how far it has travelled, and how fast.

Many interesting things have been found out in this way. I haven't time to tell you all I should like to, but there is space for one story. A plaice was once marked and popped into the sea at Flamborough Head. It measured just about eight inches. Nothing more was seen of it until eight hundred and thirty-one days had passed—over two years. Then someone caught it twenty-six miles off Aberdeen and saw the disc attached to it. When its number was looked up it was found it had swum a hundred and sixty-six miles as a ship goes, and grown to a length of fifteen inches. Facts like these help in many ways those who look after our fishing grounds.

A Funny Story

As you know, flat fish are very clever at changing their colour to match their surroundings. There was once a naturalist who thought he would like to know exactly

how far the fish could go in matching themselves with the bottom of the aquarium.

So what do you think he did? He had the floor of the tank marked just like a chessboard. Black and white squares alternated. Then water was put in, and a flat fish was placed in it.

How was it going to match its coat with the floor of the tank? Could it possibly do anything to hide itself on it?

Yes, it could! In half an hour it had altered its upper surface so skilfully that it couldn't be seen! The upper part became gradually mottled with dark and light patches, and it matched the chessboard squares so well that you couldn't tell fish from floor when you stood a little distance away!

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *How does a flat fish become flat? What happens?*

(2) *Why is its upper surface sandy-coloured, spotted or speckled?*

(3) *Put down the names of some flat fish*

(4) *Put down the names of some ordinary fish.*

(5) *Why do we mark fish?*

(6) *Have a good look at a flat fish in a fishmonger's shop and draw one from memory.*

(7) *When you have a chance, go to an aquarium and look at the flat fish swimming about there.*

THE JELLYFISH

" What is a jelly fish made of ?
Water and skin, but never a fin,
Never a bone, just water and skin.
What a dangerous thing to be made of :
For you're easily eaten by big or small,
The storm will break you, and worst of all,
The sun will melt you to nothing at all ! "

ONE of the quaintest creatures to be found in the sea is the jellyfish. Have you ever seen one ? Perhaps you have only seen them thrown up on to the beach, a battered pulpy mass—or maybe you have been lucky, and watched them floating along in the water like little jelly umbrellas whose handles are missing.

Have you wondered what sort of life they lead, and how they get their food, and what makes many of them sting ? Their story is so queer and interesting that I think I must really tell you all about them.

Eggs

WE will begin at the beginning. A large jellyfish, one day in the autumn, has eggs packed away in the four round spots you can see at the top of the umbrella. From these tiny eggs the strangest of little creatures

JELLYFISH

(*Top*) *Stinging Jellyfish.* (*Middle*) *Common Jellyfish.* (*Bottom*) *Sea-Acorn.*

hatch, not a bit like the jellyfish. They are very, very tiny, just wee specks in the water. You wouldn't notice them at all. They float off merrily, and lead their own lives in the sea for a while, but when the winter is near, with its rough winds and crashing waves, the baby things find a safe anchorage somewhere. They choose a bit of seaweed or a stone at the bottom of the water, and fasten themselves safely to it. There they sit, all through the winter, and make good meals of the minute things, even smaller than themselves, that come floating through the water towards them.

Planulas

THESE quaint babies are called Planulas, and if you saw some you would think they looked rather like very, very small sea-anemones. At the top end of each of them is a mouth, and round it grows a little fringe of very fine tentacles. If you could watch the Planulas, you would see all of them waving their mouth-fringes, lashing the water to bring any tiny creature into their reach. This is the way they get their food, and gradually they grow bigger. Many of them go to make up the dinner of larger creatures, but even then so many are left that there is never any fear of jellyfish dying out.

Magic

NOW comes the very strange part of the jellyfish's story. It is just like magic.

The Planulas grow taller and taller, until they are the shape of inverted sugar-loaves. Then one day, all down the length of each Planula, appear little

waists, as if it had suddenly put on a lot of tiny invisible belts and drawn itself in tightly in many places.

These waists grow smaller and smaller, as if the invisible belts were being tightened every day. The Planula then looks as if it were a pile of tiny saucers, placed one on top of the other, ready to be washed.

Then something happens to the rim of each saucer. Little fringes of tentacles grow, like very fine hairs, and begin to lash the water. The Planula looks most queer, and has such thin waists that a passing shrimp might wonder if the saucers were going to tumble off in the next current that came.

Then suddenly the top saucer breaks itself off, turns upside down, and gaily floats away. It is a little new jellyfish! Soon the second saucer breaks off, turns upside-down, and, hey presto, there is a second jellyfish!

All the saucers do the same until there is nothing left of the Planula at all. It has changed itself magically into a number of young jellyfish, that no longer want to stay fixed to a stone or seaweed, but like to swim merrily through the water, and lead a wandering life.

Jellyfish

They are very tiny at first, of course, but they grow very quickly indeed, and soon reach the size of the large jellyfish we find floating about in the summer. Let us see what it is like.

It is not a fish, of course. Anyone can see that. Fish have a backbone, but the jellyfish hasn't a bone at all in its queer body. It has only a very thin skin —so thin that if you try even to pick it up and turn

it over, the skin breaks and your fingers sink right into the creature's body of white jelly. It has no shell, and nothing in the way of armour to protect it. But it has the power of stinging, as you probably know, if you have been bathing when jellyfish are in the sea.

Those long threads fringing the rim of the umbrella are the sting threads. If you touch them you will feel as if you have touched a stinging-nettle. Tiny creatures of the sea often swim into them, as the jellyfish lashes out, and they become paralysed, and soon die. The jellyfish makes good meals of them.

"How do they sting?" perhaps you will say. Well, they sting in rather a marvellous way. All down the length of each slender thread are thousands of tiny oval cells. Inside each of these is coiled up a sort of little watch-spring, with a poisoned dart at the top. Directly the cells are touched, out spring the darts and bury themselves in the body of the tiny creature that blundered against the thread. The poison gets to work, and the creature dies.

When *we* touch a jellyfish's thread the same thing happens, and lots of little poisoned darts prick our skin and cause us pain. It is queer to think that darts so tiny—they can only be seen with a microscope—are able to do so much harm!

The Jellyfish's Lodgers

ALTHOUGH the jellyfish has these hundreds of sting-threads, a number of shrimps, tiny fish, and other little creatures take shelter under the big jelly umbrella, and swim about there as the jellyfish goes on its way! They are like lodgers, for they get shelter and food from the jellyfish, and some of them actually

live in the four funny little pockets found under the umbrella.

The lodgers get their food by eating up the tiny creatures wafted in by the lashing of the sting-threads. They seem quite happy and contented with their strange home, and manage in some marvellous manner to keep out of the way of the threads, which would certainly kill them and make them into a dinner for the jellyfish !

Swimming

Jellyfish swim by opening and half-shutting their umbrellas, and get along splendidly. They often swim in shoals, and then it is marvellous to watch how they avoid bumping into each other. They are really a wonderful sight in the water as they swim by in hundreds, gracefully opening and closing their umbrellas, sometimes rising to the surface, sometimes sinking down out of sight. Their fringes wave, and the streamers that hang from the middle of the umbrella trail behind like a bunch of pretty ribbons. You can see them splendidly from a boat or from the end of the pier. They are fascinating to watch.

At Night

At night they are lovelier than ever. They look like globes of soft light, and you might think a sea-sprites' ball was going on down below in the water, and that the jellyfish were lighting up the ballroom. They gleam with a phosphorescent light, and are really beautiful. You must try and see them one night if ever you possibly can.

Jellyfish soon die when out of the water. Their

bodies are practically made of water, and when the hot sun dries them up, nothing is left but a tiny ring in the mud or sand to show where the jellyfish lay. The water is held in thousands of very tiny cells, and that is why the creature feels and looks like a pulpy jelly. You are really holding water, which is enclosed by hundreds of thin cell walls. When once the water evaporates, the walls collapse, and the jellyfish goes to nothing!

I remember once, when I stayed at Porlock Weir, in Somerset, there were great shoals of jellyfish, which at high tide were brought into the tiny little harbour there. When the tide went out, thousands of jellyfish were left stranded on the mud. There they shone in the sun like white jelly. Two or three hours later they had vanished, and only rings on the mud showed where the little creatures had been. Every one of them had gone to nothing in the hot sunshine!

Some Different Kinds of Jellyfish

THERE are all kinds of jellyfish—open umbrellas and nearly closed umbrellas, great ones many feet in diameter, and tiny ones you can't see at all. Some have long fringes, and others have none.

The Stinging Jellyfish is perhaps the most unpleasant. It often comes into shore in the late summer or early autumn. It is brownish yellow, and as large as a dinner-plate. It has a thick fringe of long yellow hairs, and with these can sting very painfully—so painfully that if you touch it with your bare hands or legs you may be in bed for a long time afterwards!

One of the very commonest of our jellyfish is the little Sea-Acorn. This is a pretty little thing, rather

like a tiny glass acorn, with two very long tentacles hanging down. From these spring out still finer tentacles, which are always lashing the water for food. It is not much bigger than a good-sized pea, and is very difficult to see, because it is so small and so transparent.

If you catch a few in a net you will see they look just like tiny lumps of jelly. Put them in a jar of sea-water, and you won't see them at all! You will just see here and there little gleams of colour, showing where the Sea-Acorns are swimming about.

Down their oval bodies run eight narrow bands. All along these bands are many tiny scales, which keep rising and falling, falling and rising, like little trap-doors. By means of these the little creature paddles itself along, and goes at quite a good rate.

There are many other jellyfish, some showing most beautiful colours. I haven't space to tell you of any more, but I have told you enough to show you what quaint creatures jellyfish are—and, if you keep your eyes open at the seaside, maybe you will find out more about jellyfish in an hour than I could tell you in a week!

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *Tell the life story of the baby jellyfish or planulas.*

(2) *Describe a jellyfish.*

(3) *How does it sting?*

(4) *What creatures shelter under the jelly umbrella?*

(5) *How do jellyfish swim?*

(6) *Draw a jellyfish, if you can.*

(7) *When you go to the seaside this year, try to find a jellyfish, and have a good look at it.*

THE CRAB

"If fishes have an aching tooth,
To Mister Crab they go,
For with his pincers he can pull
A hundred teeth, you know!"

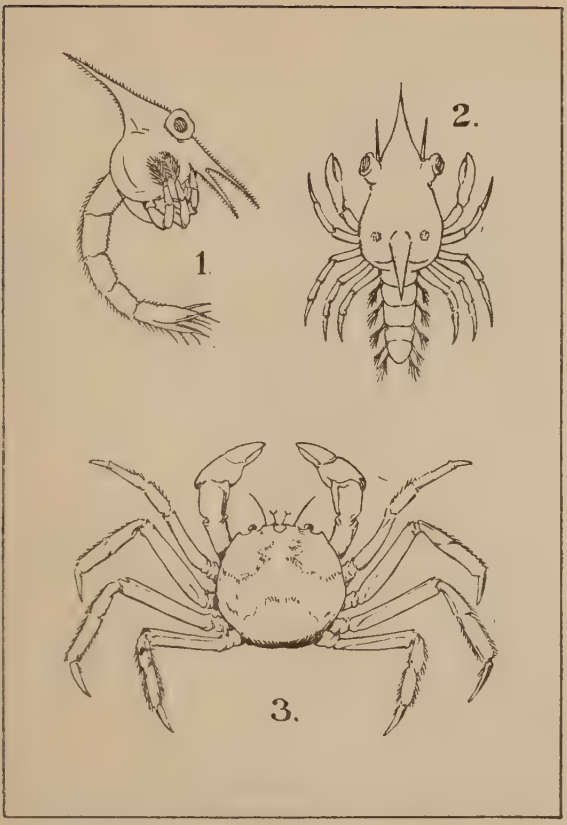
EVERYONE who has been to the seaside knows what a crab is. There is something most amusing about this creature—it looks so comical as it scuttles along with its funny squat body moving quickly sideways.

It *is* a queer creature, too. It has a curious life story, and is altogether an interesting little being.

A Crab-baby

WHEN a crab hatches from its egg it is a quaint-looking thing, not at all like its parents. It is such a tiny creature that it is not even as big as a pin head! If you could see it under a microscope, you would find out what a comical-looking thing it is. It has a long thin tail, and a big head with a funny curved horn sticking up in the middle of it. In front it has a long downward-pointing horn.

Not content with looking comical the little creatures act most comically, too—for they get along in the water by turning themselves head-over-heels! They do this time after time, and go along quite quickly.



THE LIFE STORY OF THE CRAB

1. *Zoëa* (*enlarged*). 2. *Megalopa* (*enlarged*). 3. *Perfect Crab.*

These little atoms are called *zoëas* and although they are so tiny they are very useful, for they act as water-dustmen. That is, they clear away all the little bits of decaying rubbish that float about the water and make it impure. The zoëas eat it up, and so keep the sea pure for themselves and all the other dwellers of the water.

Sometimes the crab babies swim about in shoals of millions, and become the food of all sorts of fishes and sea animals. The great Greenland whale himself likes nothing better than a delicious meal of a few million zoëas. His throat is so small that he can only eat small things—so when he comes to a zoëa-shoal, he opens wide his enormous mouth and swims through the zoëas, which disappear in no time! It takes an enormous number to provide him with a really good meal, as you can guess!

The Crab-baby Changes

After a time the little zoëa changes its appearance. It casts off its skin, and something quite different is underneath!

The new creature has enormously big eyes on stalks, which stick out from each side of its head. Its long curved horns have disappeared, but it still has a thin tail, though longer than before.

If we saw it under the microscope we should see, too, that it has tiny pincer claws—very, very tiny, so tiny that it seems impossible they could ever grow to the size of those of a big crab. Its legs, too, begin to look like legs, and are much longer. If you look at the picture you will see what a queer-looking creature it is.

It is called a *megalopa*, which means "a creature

with big eyes "—and a very good name it is, too! It swims in the same way as before, by turning somersaults, and its food is the same, too, any decaying rubbish it can find.

The Perfect Crab

After a few weeks the megalopa throws off its skin again, and this time becomes a perfect little crab. It still has a tail, but this is bent back underneath its body, as you can see quite well if you pick up any little crab and turn it upside down. Its back is now broad and flat, and its front claws are proper little pincers. All parts of its body, including its legs, are enclosed in a hard armour for protection.

The Armour

This armour, or "shell" as we usually call it, is not made of the same sort of stuff as proper shell, such as that of a whelk or mussel. A whelk or mussel shell grows as its wearer grows, and is never cast off. But a crab's shell does not grow. It can't. It does not even stretch, for it is far too hard and brittle to be elastic.

What will happen when the crab's soft body inside grows, then? It will surely burst the shell! That is exactly what it does do. The shell bursts and out hops the crab.

This is how it happens. One day the crab feels rather queer. It does not feel like fighting or looking out for food or defending itself. It wants to be alone until it feels better. So it hides itself away in a hole somewhere, and waits to see what is going to happen to it.

As it lies there an extraordinary thing happens.

Almost a third of its body turns to water inside its shell! You can hear the water quite plainly if you shake the crab about.

Then it becomes very fidgety. It wriggles about and shakes itself, and turns and twists and rubs its legs against one another. It is trying to work its shell loose from its body—rather a difficult job.

It gets loose at last, and then all at once its shell splits right down the back, the crab makes an effort, and out it jumps from its old shell! No sooner has it done so than the split in the shell shuts up again, and you have to look very hard indeed to tell which is the real crab and which is just shell.

The crab is now tired out, and lies still for some time. Its body is hard and knotted, for its muscles have been making such tremendous efforts that they are cramped.

When they are all right again, and the cramp is gone, the crab begins to grow. It grows so very, very fast that anyone watching the crab that day would hardly believe his eyes—for by the same time next day the crab is about half as big again!

Then a new shell begins to grow, and very soon the crab has a fine fresh suit of armour, and saunters out in the world ready for any enemies.

After that, it changes its coat once a year, and sometimes oftener. It all depends how quickly it grows. When it is "grown up" it no longer bothers to get new armour, for it never grows out of the suit it had at its last moult.

A Crab's Eyes

HAVE you ever looked closely at a crab's eyes? They are rather odd-looking things, for they grow on a kind

of short stalk. Each stalk has a black spot at its tip, and with these spots the crab sees.

The two spots are not just two eyes, but hundreds and hundreds of eyes ! Each spot is made up of perhaps two thousand, and with these the crab sees all round it. It cannot move them about as we move *our* eyes, so it has to have a great collection of them which point all ways, up and down and round about, so that no matter in what direction the crab wants to look, it has eyes through which it can do so. If he wants to look up he uses his topmost eyes, and if he wants to look sideways he uses the eyes at the side.

A Crab's Ears and Nose

Did you know that crabs have ears ? They are not very good ones, certainly, but as sounds carry better under the water than through the air, the crab finds his ears answer very well indeed.

I will tell you where to look for them. Look at the two pairs of feelers on a crab's head. Find the first joint of the smaller feelers, and examine it closely. You will see on each a little bag (gland we call it), which has in it a minute drop of salt and water. These little bags are crab's ears, and it hears with them quite well.

Now look at the first joints of the other pair of feelers, and you will see there two more tiny glands. These are the crab's " noses," for it smells with these. " Queer noses ! " you will say, but yet the crab manages to smell out its food with them, and will hurry along to the bait in your prawn-net, where you will find him busily gobbling pieces of the fish you had put in to catch prawns. It will go scurrying along the bottom of the sea too, smelling out the bait that a patient

fisherman has put on his hooks, and will feast on it, and hold it so fast that when the line is drawn up Master Crab goes up too !

Non-swimmers

Most crabs cannot swim, but can only crawl over the sand or rocks. A few can swim, however, such as the pretty Fiddler Crab, with his back-legs turned into paddles. His less lucky brothers, when thrown into the water, simply sink to the bottom of the sea with all their legs sprawling out as they go.

You will not find many large-sized crabs among the rock-pools when the tide goes out. The big crabs, such as the Edible Crab you see on the fishmonger's slab, prefer deep water and are only to be caught there. This is just as well perhaps, when you remember what great pincers they have. Even a small crab can give your fingers or toes a nasty nip, and hold on like a vice ; the big crabs could hold you so tightly that you could not free yourself !

Crabs Twelve Feet Across

Crabs are of all sizes, from the giant Japanese spider-crab that measures twelve feet across its limbs, and makes a feast for scores of people, to the tiny little pea-crab just about half an inch big. There are land crabs as well as sea crabs. Some live so far inland that they only visit the sea once a year to lay their eggs. Others visit it once a day just to moisten their gills in order to make it possible for them to breathe out of water.

The crabs belong to the family called Crustaceans.

Lobsters belong to it too, as well as shrimps and prawns. The curious creatures called Hermit-Crabs are also members of the same family. So are the coconut crab, and the spiny crab, the long-beaked crab, and the funny little pea-crab ; and if you are lucky perhaps you will be able to find some of them when next you visit the seaside.

QUESTIONS TO ANSWER AND THINGS TO DO

(1) *Tell what you know about the crab-baby.*

(2) *Why do crabs have hard shells?*

(3) *What happens when a crab's body becomes too big for its shell?*

(4) *Where are its eyes? Its ears? Its noses?*

(5) *Which crab swims? How does it manage to?*

(6) *Draw a crab, if you can.*

(7) *If you go to the seaside, catch a crab and look at it carefully. Find its eyes.*

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